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SOME ASPECTS OF GLACIAL DRAINAGE CHANNELS IN BRITAIN

PART I

J. B. SISSONS

THE interpretation of the glacial drainage channels of the Cleveland Hills put forward by Kendall in 1902¹ has since that time been taken as the model for most other British studies of such channels. This interpretation assumed that many (perhaps most) channels were formed by the overflowing waters of ice-dammed lakes. It also assumed that meltwaters rarely, if ever, flowed under, over or through the ice. The ice was thus regarded as an almost impenetrable 'barrier' or 'dam' terms that have been subsequently used by many authors.

Kendall's interpretation is not in accord with the evidence from receding temperate glaciers of the present day, however. The classic studies of Russell, Tarr and von Engel, as well as later studies, make it clear that almost always the land drainage and marginal drainage, as well as the supraglacial drainage, rapidly find their way into and beneath the ice itself. Where open lakes exist their waters may sometimes escape over cols, but far more often they are drained from time to time by englacial or subglacial tunnels. Furthermore, Kendall's hypothesis fails to explain many aspects of the form and distribution of glacial drainage channels.

In Part I of this paper these criticisms of Kendall's interpretation are amplified. This theme was introduced in an earlier paper². In the present paper much additional material is presented. In Part I evidence in the British literature is discussed. It is shown that this evidence, rather than supporting Kendall's interpretation of the origins of melt-water channels, often points to conclusions differing considerably from those he reached. The difficulties encountered by many authors in applying Kendall's hypothesis to various parts of Britain, and considered by these authors to be exceptional, form the basis of a re-interpretation of the evidence in which interpretations of the type put forward by

Kendall are themselves the exceptions. In Part II certain types and patterns of meltwater channels will be described and explanations of their modes of origin suggested, particular reference being made to the drainage of modern glaciers and to channel systems mapped by the writer in Britain.

Glacial drainage channels and the sites of former ice-dammed lakes had been described in various parts of Britain before Kendall published his well-known paper. For example, in 1869 A. Geikie provided a brief, clear description of channels in the upper Tweed valley, referring to the "remarkable hollows or trenches, like old water-courses, running along the slopes of some of the hills, but without any stream" and suggested: "Possibly they should be referred to a time when the drainage of the district was greatly modified by large accumulations of snow and ice"³. The former existence of ice-dammed lakes had been deduced particularly by Carvill Lewis in the Pennines⁴ and by various writers in the Glen Roy area⁵.

The Glen Roy controversy is especially interesting since it throws light on the different views of glacier drainage that were held at the time. While Jamieson⁶ argued for ice-dammed lakes overflowing solely through various cols, others attacked this view. For example, Prestwich pointed out that the Marjelen See (later to be mentioned by Kendall⁷) "has been adduced in illustration of the power of glacier barriers", but that "the water escapes almost every year, and the lake drains in the course of a few hours through crevasses in the great glacier"⁸. He also mentioned the drainage of Himalayan ice-dammed lakes through crevasses in the ice. Prestwich also suggested that glacier ice could not withstand the hydrostatic pressure of such large lakes as Jamieson claimed for Glen Roy, a point that has been fairly recently discussed by Glen⁹ with regard to ice-dammed lakes in general. Livingston¹⁰, although he reached a different conclusion regarding the origin of the "roads", made similar criticisms to those of Prestwich concerning the lakes. Livingston mentioned the annual draining of Norwegian ice-dammed lakes. Concerning the Marjelen See he wrote: "If it proves anything at all, it proves that the supposed Lochaber lakes were an impossibility"¹¹. In a summary of his conclusions, he stated: "These barriers of decomposing and crevassed ice would be tunnelled underneath by a glacier river, from which, owing to the depth of the lakes behind the barriers, an enormous pressure would be exerted upon the over-arching ice, causing it to disrupt"¹².

These quotations, and others that might have been given, show that some British workers on problems of glacier drainage in the late nineteenth and early twentieth century were attempting to apply to Britain the evidence of modern glacier drainage. In the twenty years up to 1912 much further evidence became available from studies on Alaskan glaciers by Russell¹³, Tarr¹⁴, Von Engeln¹⁵ and others, and from studies elsewhere by workers such as Tarr¹⁶, Garwood¹⁷ and Rabot¹⁸. These publications on Alaska still provide the best body of evidence on drainage conditions associated with temperate glaciers.

Kendall was familiar with this work, for he referred to it in some

of his publications. Yet he did not apply it. In his Cleveland Hills paper he nowhere referred to examples of drainage into, onto or beneath the ice, although he mentioned the theoretical possibility in his introduction¹⁹. Some twenty years later he still maintained the same hypothesis in the *Geology of Yorkshire*. This is clearly shown at one point in his discussion of channels when, having put forward what he obviously felt was a rather inadequate explanation for some channels in the Dallow Gill area of north Yorkshire, he went on to say: "The alternative is the even less plausible one of supposing a subglacial drainage system such as on occasion taps the waters of the chain of lakes margining the great Malaspina Glacier where it abuts against the Chaix Hills²⁰".

Nevertheless Kendall was quite clear about the limitations of the evidence he presented for his ice-dammed-lake view. As noted later he was fully aware of the paucity of depositional evidence for the lakes and he built up his hypothesis on the assumption that most of the Cleveland channels are lake overflows. Discussing channels in his introduction he said: "I have placed my chief reliance upon them in the identification of the series of lakes which form the subject of this paper²¹". Yet he also recognised that many channels show features difficult to explain by his hypothesis. For example, the problem of up-and-down channels, which has recently provoked discussion²², was early considered by him²³. He noted too the fact that in some cols, where one would expect to find channels according to his hypothesis, there are no channels. He was also aware of the difficulty of applying his hypothesis to an upland where the channels show that, at the time many of them were cut, the upland was entirely surrounded by ice.

Despite Kendall's clear statements concerning the limitations of some of his own evidence and despite the quite different implications of drainage studies on existing glaciers, his views have received widespread acceptance. Rare criticisms, such as those of Bonney²⁴, were ineffective. One can only presume that the simplicity of Kendall's interpretation and the fact that, once put forward, it appeared so obvious, were major factors in this general acceptance. His views have been subsequently applied in numerous papers to many parts of Britain. After a time many writers did not even consider it necessary to present the detailed evidence for their conclusions. For example, Bremner, who carried out much valuable research on glacial problems in the Highlands, nevertheless wrote: "The cause, character and significance of overflow channels is now so well understood that there is no need for any detailed description of those in the area under discussion²⁵".

Although papers in which Kendall's interpretation is accepted are still published quite frequently, doubts as to the validity of his views have been expressed by a few writers. Foremost among these is Carruthers²⁶, who believes that the lakes did not exist, their supposed sites being occupied by stagnant ice. Peel has pointed out that in Britain "thought has been perhaps unduly influenced by Kendall's concept of freely draining lakes despite the common and disturbing lack of any independent direct evidence for such lakes²⁷". Common wrote: "The last word on the subject of meltwater channels has by

no means been written" and "there is still a great deal to be learnt about them and from them"²⁸, a statement that contrasts greatly with Bremner's opinion quoted above.

Despite the fact that Kendall's hypothesis has been widely accepted, there appears in almost every paper dealing with channels evidence that does not accord with his hypothesis. Most writers have considered such evidence in their respective areas as local minor anomalies and not as invalidating Kendall's interpretation. Analysis of the literature shows, however, that the same anomalies occur in many different areas and, taken together, they present a significant body of evidence that necessitates thorough reconsideration of the orthodox ice-dammed-lake hypothesis. Some of this evidence, as well as some other points revealed by the literature, is considered in the following pages.

The rarity of shoreline features. As pointed out elsewhere²⁹, almost all the supposed ice-dammed lake-sites in upland Britain lack definite shoreline features. For example, Kendall wrote in his classic paper: "I am unable to cite a single well-marked example in the Cleveland area"³⁰. Some twenty years later he extended this generalisation, saying: "Lake beaches are disappointingly infrequent in English areas"³¹. It is arguable that this infrequency of shorelines in England may be due to subsequent weathering and mass-movement. This seems less likely, however, in Scotland, especially in the Highlands. Yet in the latter area Charlesworth³² has recently catalogued and indicated on maps hundreds of former ice-dammed lakes without shorelines. Glen Roy, with adjacent glens, still remains the "brilliant exception"³³, the shorelines of Rannoch Moor being similar in form but much less extensively developed³⁴.

The rarity of definite deltas. Since many channels have clearly been cut by large volumes of water flowing with considerable velocity, there should be masses of sand and gravel at channel exits if these channels debouched into ice-dammed lakes, a result of the sudden checking of the velocity of the meltwaters. These deposits should be roughly proportional to the volume of rock removed in the excavation of the channels at whose exits they lie, due allowance being made for the finer materials carried further afield in solution and suspension. Furthermore, it is a reasonable expectation that, in the more recently glaciated parts of Britain, these deposits would show typical deltaic forms with surfaces gently inclined lakewards and steep frontal slopes. In the less recently glaciated parts such forms might be expected to occur at least at the exits of the larger channels, for they should have survived owing to their large volume and permeability.

Yet a study of the British literature on this subject shows that these conditions are rarely fulfilled. This is particularly significant when it is remembered that almost all authors have diligently sought such evidence in order to demonstrate the existence of lakes. At the lower ends of many channels, including some very large ones, no sand and gravel deposits at all have been recognised, a fact very difficult to explain if the channels emptied into lakes. At the lower ends of some other channels such deposits do exist, but they rarely display typical deltaic forms. These are the deposits that have been frequently interpreted as deltas. It is suggested that such interpretations would in many instances not

have been put forward had not their authors been looking for evidence of ice-dammed lakes. Kendall was quite clear about the lack of deltaic forms in Cleveland, saying that the deltas of that area are usually "simply patches of current-bedded sand and gravel"³⁵. As an example from the recent literature Twidale's paper on north Lincolnshire may be cited³⁶. He mentions "numerous deposits of more or less rounded chalk gravels—presumably derived from the excavation of the channels"³⁷. No reference is made to delta forms. The folding map illustrating Twidale's paper shows thirty-five patches of chalk gravels and sands, but only seven in fact occur at the lower ends of channels. Half the "overflow" channels shown on the map have no deposits at all at their lower ends, while in two instances chalk gravels and sands occur by the channel intakes.

The general absence of definite deltas, along with that of shoreline features, from the great majority of the supposed ice-dammed lake-sites of Britain must surely mean that the great majority of the lakes of the dimensions postulated did not exist. If the supposed lake-sites were largely or entirely occupied by the ice itself the absence of deltas as well as many difficulties that have been encountered in explaining channels can be resolved (*see Part II*). Where deposits appear to be absent from the lower ends of channels this is probably because the streams that cut the channels continued to flow unchecked into (or, probably less commonly, onto) the ice itself. Ill-defined spreads of sand and gravel at the lower ends of channels (where not a result of later mass-movement and weathering) may be due to the streams that cut the channels having had their velocity checked on flowing into (or, perhaps, onto) the ice, so that they began to deposit, these deposits having been subsequently redistributed and possibly mixed with ablation moraine on being let down onto the ground as the ice wasted away. Where mounds of sand and gravel occur at the lower ends of channels they may be due to deposition in crevasses and, perhaps, moulins, producing kames, or in subglacial (or, less commonly, englacial) tunnels forming eskers³⁸. In some areas channels terminate in ground occupied by accordant-summitted kames, the kames sometimes having steep sides and quite extensive flat tops with kettles and partly closed depressions between. Such deposits suggest the existence of a lake that was largely choked by ice, deposition having occurred around and over blocks of dead ice. Strath Allan in Perthshire provides an example. Examples described in the literature are the highest aggradation level near Eaglesham, Renfrewshire³⁹ and the northern part of the Eddleston valley, Peeblesshire⁴⁰. In yet other instances the deposits at the lower ends of channels form distinct terraces, which are occasionally pitted with kettles. These kame terraces, laid down mainly by streams, sometimes in very narrow marginal lakes, were long ago described by Jamieson⁴¹. Numerous examples exist in Scotland⁴² and particularly fine examples in the Vale of Eden have been described and mapped by Trotter⁴³.

Although any of the types of depositional forms mentioned may be partly delta-bedded, this proves the existence of a lake only at the locality where a particular delta-bedded deposit occurs. That many such lakes were of very limited extent, often being merely narrow strips

of water situated between the ice and rising ground is often proved by ice-contact slopes.

The depositional forms referred to above are best preserved in the more recently glaciated parts of Britain, particularly in Scotland and north-west England. It was not in these areas, however, that Kendall's ice-dammed-lake hypothesis was initially developed. Furthermore, much of the early work that firmly established his ideas was carried out in the less recently glaciated parts of Britain. Here the patches of sand and gravel, at channel exits, that have been interpreted as deltas have lost the initial sharpness that would have suggested other origins. Further north in Britain, however, the various origins of such deposits can often be readily deduced. It is significant that, with the important exception of Charlesworth's major paper on the Highlands ⁴⁴, there have been published for parts of Scotland very few, if any, maps of the type so often published for parts of England and Wales showing sequences of lakes whose extent has been deduced almost entirely from the altitudes of channel intakes and outlets. It is also perhaps significant to note that when Kendall turned his attention to East Lothian, an area with abundant sand and gravel deposits formed contemporaneously with the channels, he only once used the term "overflow channel", implying the existence of lakes, otherwise referring constantly to "glacial drainage channels ⁴⁵".

The doubts concerning bottom deposits. This topic will be considered only briefly, since Carruthers ⁴⁶ has discussed it in considerable detail. Bottom deposits have not been reported from many of the ice-dammed lake-sites postulated in the literature. For example, Kendall was able to cite significant evidence in the North York Moors only from the Esk valley and much the greater part of the section headed "floor-deposits" in his 1902 paper is concerned with such deposits in areas other than the North York Moors ⁴⁷. Carruthers has pointed out that sediments have often been interpreted as lake-floor deposits because they are banded and has strongly maintained that such "banded dirt" have been laid down beneath glacier ice and are related to the "bottom melt". This view has not been favourably received in this country, but in both Sweden ⁴⁸ and Canada ⁴⁹ hypotheses involving the flowage of saturated till beneath glacier ice have been put forward to explain dead-ice moraine forms. These interpretations, made by workers of very considerable experience, suggest that some of Carruthers' ideas deserve more serious consideration than they have received so far. While not accepting all Carruthers' views, the present writer suggests that Carruthers has presented sufficient evidence to give rise to serious doubts regarding the orthodox interpretation of many supposed lake-floor deposits.

The nunatak problem. The orthodox ice-dammed-lake interpretation, which takes no account of drainage beneath, through or over the ice itself, encounters a serious difficulty where channels and related deposits show that nunataks developed during deglaciation. Certain writers have recognised this difficulty and have been forced to postulate subglacial, englacial or supraglacial drainage to overcome it. Kendall was aware of this difficulty, at least with regard to the Cheviot Hills, for the evidence of channels led him to conclude that ice-streams on the

northern and southern flanks of this hill-mass were probably confluent on the eastern slopes. Thus the Cheviot Hills were probably surrounded by ice at the time many of the channels were formed. Kendall wrote (with Muff ⁵⁰): "If the two glaciers were confluent, then the ultimate escape of the overflowing water of our lakes must have been either beneath the ice, as at the present day happens with the overflow from a chain of ice-dammed lakes on the Malaspina Glacier, or else over the top of the ice". Bremner ⁵¹ invoked a subglacial or englacial escape for a marginal stream that had existed on the slopes of a small nunatak in the Stonehaven area. Supraglacial drainage was mentioned by Raistrick ⁵² to carry away meltwaters that had cut channels on the flanks of a nunatak formed between the confluent Wharfedale and Airedale ice. Similarly, Tillotson ⁵³ mentioned drainage through or over the ice from a nunatak formed between the confluent Vale of York and Nidderdale glaciers.

In the four papers cited drainage from the ice-free ground into, over or beneath the ice was suggested only to overcome the nunatak difficulty. Yet it is arguable that if such drainage occurred at one point in each of these areas it may well have occurred also at numerous other points in each area.

The emergence of nunataks is not peculiar to these four areas, however. Nunataks must have developed on numerous occasions in Britain and, whenever this occurred, the meltwaters must have escaped englacially, subglacially or supraglacially. Some of these nunataks may have been extensive tracts of higher ground, others were only small isolated hills. Examples of both types occur in Dwerryhouse's glacial map of the Alston Block ⁵⁴, which is shown completely surrounded and partly overwhelmed by ice, forming three major and four minor nunataks. Series of ice-dammed lakes are shown on the flanks of the major nunataks. Dwerryhouse did not discuss the problem of the ultimate escape of the waters of his lakes. It should be added that the development of nunataks during deglaciation was probably far more frequent than is implied in the literature, since, except in a few instances, the significance of downwasting (as opposed to backwasting) of the ice has not been sufficiently appreciated.

Where nunatak escape-drainage occurred over the ice no evidence of the former stream-course is now recognisable, and this is probably also true of englacial escape in most instances. Where the waters escaped subglacially, however, eskers or channels were often formed. For example, the channels plunging steeply down the northern slope of the spur shown in Figure 1 carried waters from this spur (which was at that time part of a nunatak) beneath the ice occupying the Kingledoors valley. That these steeply inclined channels were cut subglacially, and not extraglacially, is shown by the fact that more than one occurs in each re-entrant, for, without the presence of ice in the re-entrants, only a single channel would have been cut, down the centre of each. An example of eskers formed by waters draining from a nunatak is the Thankerton "kame" and associated eskers, which were formed by drainage from the Tinto Hill nunatak in south Lanarkshire ⁵⁵.

The conditions of drainage from nunataks suggested above are, of course, the same as those that operate on modern temperate glaciers, as

was made clear half-a-century and more ago by Russell ⁵⁶, Tarr ⁵⁷ Von Engeln ⁵⁸ and others. For example, Russell, discussing the Malaspina Glacier, stated: "When a steep mountain spur projects into an ice-field the lines of drainage on each side converge and frequently unite at its extremity, forming a lake, from which the water usually escapes through a tunnel in the ice ⁵⁹". Tarr ⁶⁰ gave a graphic description of the way in which the Kwik River plunged beneath the ice bordering the slopes of a nunatak to flow subglacially for upwards of five miles, descending 500 feet in this distance.

The problem of up-and-down channels. As with many other problems encountered by his hypothesis, Kendall was familiar with this one too. His views and those of others will be summarised in Part II. In the present context it need only be remarked that, when only a few examples of channels with up-and-down long profiles produced by erosion were known, it was not unreasonable to invoke special local circumstances such as ice-margin oscillations and reversal of lake overflow. It is now apparent that such channels are numerous and widespread. They have been described as occurring in the Cleveland Hills ⁶¹, Durham ⁶², Northumberland ⁶³, Lincolnshire ⁶⁴, the borders of the Lake District ⁶⁵, North-East Scotland ⁶⁶, Peeblesshire ⁶⁷ and East Lothian ⁶⁸. Examples not described in the literature are known to occur in Midlothian, Peeblesshire, Perthshire and Kincardineshire. The existence of numerous channels of this type is difficult to explain in terms of Kendall's hypothesis and it will be suggested in Part II that a common cause of erosional profiles of this type was subglacial stream erosion under hydrostatic pressure, while some others were produced by reversal of drainage (but not in the manner envisaged by Kendall and other writers).

The significance of the absence of channels in some localities. If one adopts the interpretation put forward for the Cleveland Hills by Kendall as of general application, a major difficulty arises concerning the absence of channels. If, as Kendall believed, and many others have accepted, all channels were formed subaerially, it follows that on every spur down which the ice-margin retreated there should be a continuous parallel sequence of channels (Kendall's terminology), so positioned that immediately one channel was abandoned the next lower one in the sequence began to be excavated. Channels exhibiting this relationship do occur, of course, but an examination of many published maps of channels shows that very frequently indeed there are gaps, often very large gaps, in the sequences with no channels at all. In order to overcome this difficulty Kendall ⁶⁹ suggested that some of these gaps might be explained by adjacent ice-dammed lakes having become confluent across the intervening spur-crest. This explanation might apply in certain instances, but, even if one accepts the ice-dammed-lake hypothesis, it can hardly be invoked repeatedly, especially as in many instances the form of the ground renders it highly improbable.

The difficulty ceases to exist once drainage into the ice is recognised as commonplace. Such drainage has been repeatedly described as occurring in Alaska and elsewhere on existing glaciers. De Boer made the point in concluding a short paper on a small ice-dammed lake in Norway that had been drained through an ice tunnel, saying: "Support

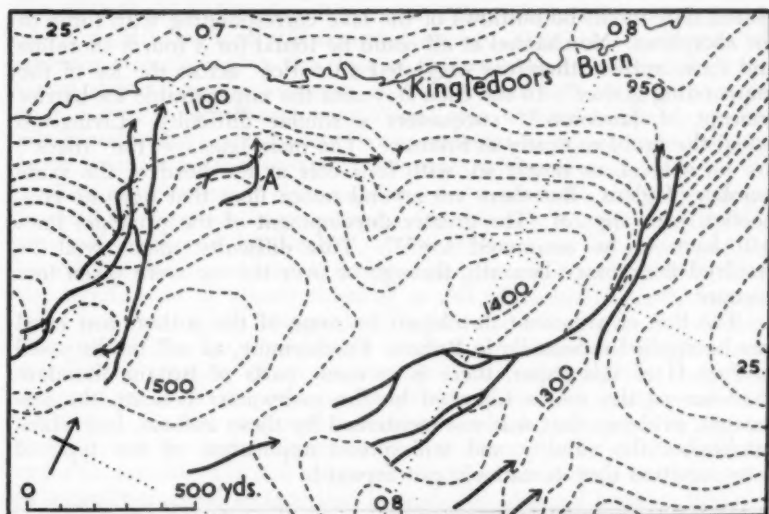


Fig. 1 Meltwater channels on part of spur between upper Tweed and Kingledoors Burn, mapped by R. J. Price. Dotted lines are kilometre National Grid. Channel A will be referred to in Part II. *Crown Copyright Reserved.*

is... given to the suggestion that the absence, or unexpected smallness, of certain channels in an otherwise complete sequence of overflows is due to drainage into the ice front⁷⁰. As already mentioned, Kendall was familiar with such evidence but did not apparently attach any significance to it. Charlesworth, too, has failed to apply to Britain the evidence provided by modern glaciers, for in his papers on channels he does not mention examples of drainage into or beneath the ice, although in *The Quaternary Era* he summarises this evidence and gives numerous references.

A number of workers, however, have suggested drainage into or beneath the ice to account for the absence of channels. For example, Jowett and Muff were unable to find an "overflow channel" for a lake they thought may have existed in the Hawksworth valley in the Bradford-Keighley area and therefore suggested drainage "over or through the ice-barrier"⁷¹. Dixon and others⁷², discussing the Carlisle-Silloth area, suggested subglacial drainage of a lake owing to the small size of the channels available for draining it subaerially, while Eastwood⁷³ suggested drainage over or through the ice owing to the absence of channels at one point in the Maryport region. Raistrick⁷⁴ suggested drainage under the ice to account for the absence of channels at one locality in Borrowdale and appears to have envisaged an important subglacial drainage system. The evidence from Rannoch Moor is particularly significant. Here several shorelines of the Glen Roy type are faintly but definitely preserved and prove the existence of a lake at several levels⁷⁵. Yet the outflows of this lake are uncertain. For example, Mathieson and Bailey found three channels that were "rather disappointing in appearance" and with obvious reluctance sug-

gested they might be outflows of the lake corresponding with three of the shorelines. No channel at all could be found for a fourth shoreline and these authors therefore suggested an outlet "across the ice of the impounding glacier". In the Glen Roy area the impenetrable ice-barrier concept of Jamieson⁷⁶ encounters a similar difficulty. Livingston posed the problem neatly as follows: "The main lines (i.e. the "roads") are on a level, or nearly so, with four cols at the head of the same number of glens. But there are several minor lines that have no connection with any col. The greater development of the principal lines will have to be accounted for⁷⁷". This difficulty might well be resolved if drainage beneath, through or over the ice were taken into account.

The line of argument developed by some of the authors just cited can be applied repeatedly in Britain. Furthermore, as will be discussed in Part II of this paper, there is in many parts of Britain abundant evidence of the routes followed by the meltwaters beneath the ice-margin, evidence that was not mentioned by these authors, but which establishes the validity and widespread application of the type of interpretation they tentatively put forward.

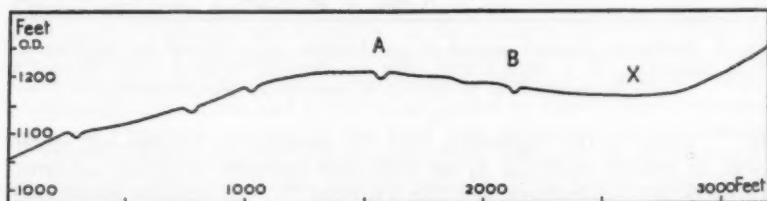


Fig. 2 Profile along crest of a spur on eastern side of Eddleston valley, Peeblesshire, showing position of five meltwater channels. A, B and X—see text.

Channels on "reverse" slopes and on minor summits on spur crests. On the interpretation put forward by Kendall channels on the slopes of spurs were formed when an ice-margin was retreating down these spur slopes. Some spur channels, however, lie in such locations that they cannot be accounted for in terms of a simple retreating ice-margin. For example, in the Lothians and Peeblesshire the writer has mapped channels running along the crests of ridges, channels that run along one side of an elongated ridge and then cross the crest-line to run along the opposite side, channels cut into the tops of minor summits on spur crests, and channels cut into the 'reverse' slopes of cols. Only channels of the two latter types, illustrated respectively by channels A and B in Figure 2, will be briefly considered here. Examples of channels on the reverse slopes of cols have been described in East Lothian⁷⁸ and the Cleveland Hills⁷⁹. Kendall and Bailey invoked ice-margin oscillations to explain the East Lothian example, an interpretation that has been discussed elsewhere⁸⁰. Figure 2 shows an example from Peeblesshire. It is clear that retreat of the ice-margin towards the lower ground on the left of the diagram will not explain channels A and B, while the usual explanation of ice-margin oscillations to account for anomalous channels will not suffice either. Channel A, which crosses the highest point of a minor summit on the spur crest, must have had

ice on both sides of it when it was cut. When channel B was formed the col X must have been still occupied by ice. This helps to explain the absence of a channel in the floor of the col, which on Kendall's hypothesis should contain a channel of considerable size. It may be noted that Kendall and Wroot mentioned cols without channels in the Cleveland area⁸¹, while Best⁸² also referred to an example from the same area. In neither case was any explanation offered.

The significance of downwasting. An explanation of the type put forward in the preceding paragraph for channels A and B in Figure 2 was not envisaged by Kendall, since at the time he developed his hypothesis the importance of downwasting was not recognised. In fact the significance of glacier thinning is still often insufficiently appreciated in Britain when interpreting glacial retreat features. As indicated elsewhere⁸³, in the considerable areas of Britain where glacier decay was by the thinning of an ice-sheet it is very unlikely that large ice-dammed lakes of the type so frequently described could ever have developed, for the supposed lake-sites would be occupied by the ice itself, its margin being closely related to the contours of the land. In order to visualise this it is suggested that the ice-surface be thought of as a gently inclined surface that is gradually lowered onto an irregular land-surface beneath. At the earliest stages only small nunataks exist, but as the ice thins these coalesce to form larger ice-free areas, the ice gradually becoming increasingly restricted to the valleys. With its implications for the orthodox ice-dammed-lake hypothesis this concept necessitates considerable revision of many meltwater channel interpretations in Britain.

Some aspects of col channels. In almost every paper dealing with meltwater channels reference is made to the existence of both very large and quite small channels. Very frequently indeed both types occur on a single spur, the very large channels often being cut into the floors of pre-existing cols and of valleys leading from them. A number of authors have pointed out that the channels on the floors of cols will naturally be deeper than other channels because they were utilised by meltwaters while the ice-margin retreated a considerable distance.

This explanation is logical if one attempts to interpret channels in terms of marginal backwasting. In terms of marginal downwasting, however, it does not apply. This is illustrated in Figure 3. On the backwasting interpretation the ice surface might occupy positions 1 to 6 during the retreat. The channel in the floor of the col would begin to be formed soon after position 2 and would continue to function until the ice had retreated to position 6. On the downwasting interpretation the ice-surface might be represented by lines A to G. In this case the col would not be ice-free until after position D. In terms of horizontal retreat the period for cutting a channel in the floor of the col would be proportional to the distance x on the backwasting interpretation but only to distance y on the other interpretation⁸⁴. Thus on the downwasting interpretation a different explanation from the currently accepted one is required for the large channels frequently present in pre-existing cols.

This explanation is suggested by the form of many col-channels and

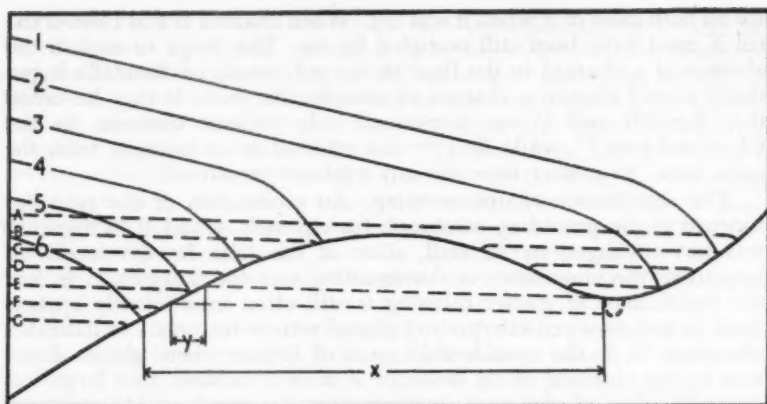


Fig. 3 Diagrammatic illustration of time available for subaerial excavation of a col channel on backwasting hypothesis (ice positions 1-6) and downwasting hypothesis (ice positions A-G). X and Y—see text.

by their relationships to other channels and depositional features. Some col-channels have up-and-down profiles that suggest a subglacial origin (see Part II). Col-channels often form part of complex channel-systems that cannot be explained in terms of marginal drainage without invoking complex and improbable ice-margin oscillations. The sides of some col-channels are cut into by later channels, which are often themselves of subglacial origin. In some instances eskers lead into the heads of col-channels, thus proving that ice, not a large lake, lay immediately upstream of them, and favouring the interpretation of the col-channels as subglacial features. Several examples of this relationship are known to the writer in the Highlands and Lothians. Bremner⁸⁵ described an example in the Stonehaven area and suggested that the channel might have been partly formed subglacially.

In addition to these points the great size of many col-channels seems inconsistent with the orthodox interpretation. Repeatedly in the literature one finds adjectives such as "magnificent", "huge", "vast", "capacious", "remarkable", etc., used to describe them. Yet the adjacent channels are often relatively small. An example from the Cheviots will be discussed briefly since an explanation of the channels of a small part of this area, accompanied by an excellent map, appears in the Cheviot Hills memoir of the Geological Survey⁸⁶. Part of this map is reproduced as Figure 4. Anderson⁸⁷ described the col-channel (X, Fig. 4) as "an impressive gorge quite 100 ft. deep". Fifteen other channels are shown on the same spur, but these channels, with one exception which is thirty feet deep, "are all small, no more than ten feet deep at most". Anderson states that the waters that cut the col-channel were provided by "an anastomosing series of shallow feeders" marked A to E in Figure 4. The difficulty encountered by this explanation is that the total cross-sectional area of these "shallow feeders" is far less than that of the col-channel, and it is difficult to believe that the relatively small streams that cut them excavated the "impressive gorge" to the north-east. In fact, the detailed evidence given by Anderson strongly

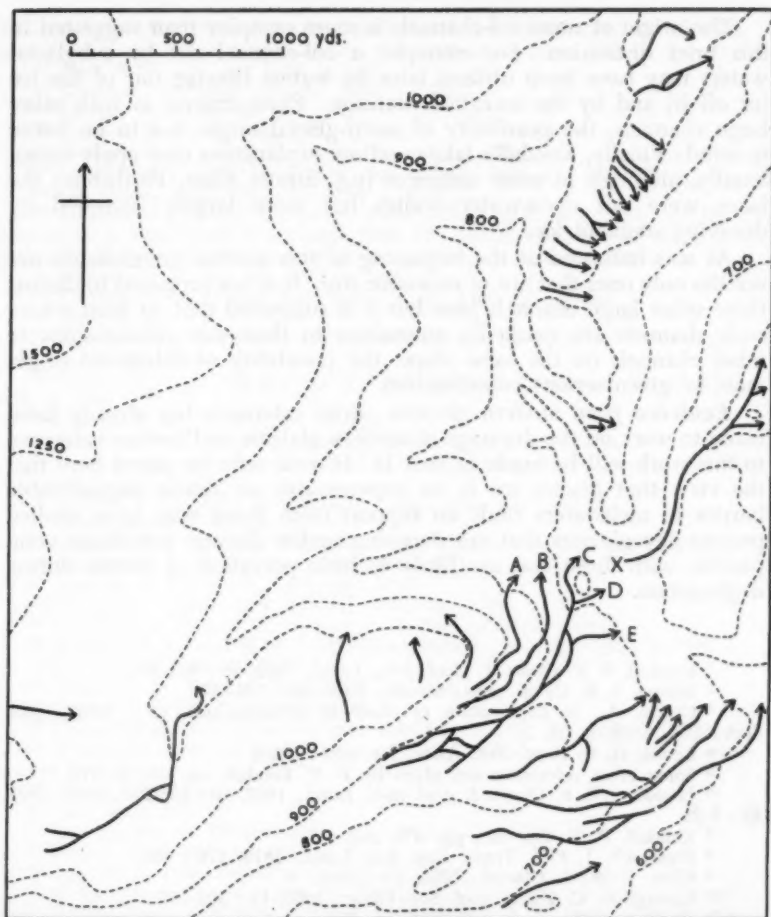


Fig. 4 Some meltwater channels on south-east slopes of Cheviot Hills. Reproduced with permission of the Controller of Her Majesty's Stationery Office from map (opp. p. 132) in *The Geology of the Cheviot Hills*, Mem. Geol. Survey, 1932.

suggests that the col-channel was excavated quite independently of the numerous small channels. These small channels appear to be of marginal, submarginal and related origins formed by relatively small volumes of water locally derived. The deep gorge is of a completely different order of size and it seems likely that it was formed by a large subglacial river that was supplied with water from a large area. The writer believes that this explanation may apply to many similar channels in other parts of Britain. Its application in part of southern Northumberland has been discussed elsewhere⁸⁸. In that area the deep col-channels lead right down to the valley floors of the principal streams and are continued as the deep gorges occupied by these streams.

The origin of some col-channels is more complex than suggested in this brief discussion. For example, a col-channel cut by subglacial waters may have been utilised later by waters flowing out of the ice (or off it) and by the marginal drainage. Furthermore, as with other large channels, the possibility of multi-glacial origin has to be borne in mind. Finally, Kendall's lake-overflow explanation may apply occasionally, although in some instances (e.g. Strath Allan, Perthshire) the lakes were not open-water bodies but were largely occupied by decaying stagnant ice.

As was indicated at the beginning of this section, col-channels are not the only ones that are of excessive size. It is not proposed to discuss these other large channels here but it is suggested that, at least where such channels are markedly anomalous in their size relationships to other channels on the same slope, the possibility of subglacial origin must be given serious consideration.

Evidence from modern glaciers. Brief reference has already been made to work on the drainage of modern glaciers and further reference to this work will be made in Part II. It need only be stated here that the view that glacier ice is an impenetrable or almost impenetrable barrier to meltwaters finds no support from those who have studied present-day glaciers that are decaying under climatic conditions comparable with those that are likely to have prevailed in Britain during deglaciation.

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TRAVELLING VANS AND MOBILE SHOPS IN SUTHERLAND

PHILIP T. WHEELER

SUTHERLAND is one of the counties in Britain which has lost and is losing a significant proportion of its population: the 1951 figure of 13,670 inhabitants represented but 53 percent of the 1851 maximum, and is actually 37 percent less than the total population in 1755. Figure I shows the distribution within the county of the 1951 population. Two features are at once clear—the marked concentration on the coastal areas, especially on the east coast, and the preponderance of certain nucleated settlements. None of these is very large (only Brora village exceeds 1,000 population), but in all they contain 35.2 percent of the total population. (See Table 1).

Parish	Settlement	1951 Population	Pop. as percent of parish population
Dornoch	Dornoch Burgh	748	38.9
Clyne	Brora	1,074	62.1
Golspie	Golspie village	915	68.9
Kildonan	Helmsdale	705	52.6
Dornoch	Embo village	374	19.5
Creich	Bonar Bridge	355	27.7
Lairg	Lairg village	318	33.1
Tongue	Tongue village	164	19.8
Assynt	Lochinver	156	17.5

Table 1. Population of nucleated settlements in Sutherland.

Taken from *A Survey of Local Conditions*, by A. C. Neish, County Planning Officer, Dornoch, 1951 by kind permission of Sutherland County Council.

These villages function largely as service and administrative centres for the surrounding areas, where population tends to be in small, scattered settlements¹. It is clear, therefore, that the decline of population, which shows no signs of stopping and has been very rapid in many of the landward areas since 1945, must be not only a problem to administrative authorities, but also a threat to the prosperity both of the service centres and of all trade within the county.

The first real development in Sutherland of local commerce in modern times, came particularly after the Clearances² in the first half of the nineteenth century, when markets were established at several centres, and many little general-merchant shops were founded, not only in the more important settlements, but also in many of the smaller townships. By the end of the nineteenth century there can have been hardly any township of significant size which did not have its own little store. These were often very small businesses, and perhaps most of them were never expected to provide the full livelihood of a family, but they existed, and, together with the growing activities of the pedlars or bagmen, constituted the first step towards the breaking down

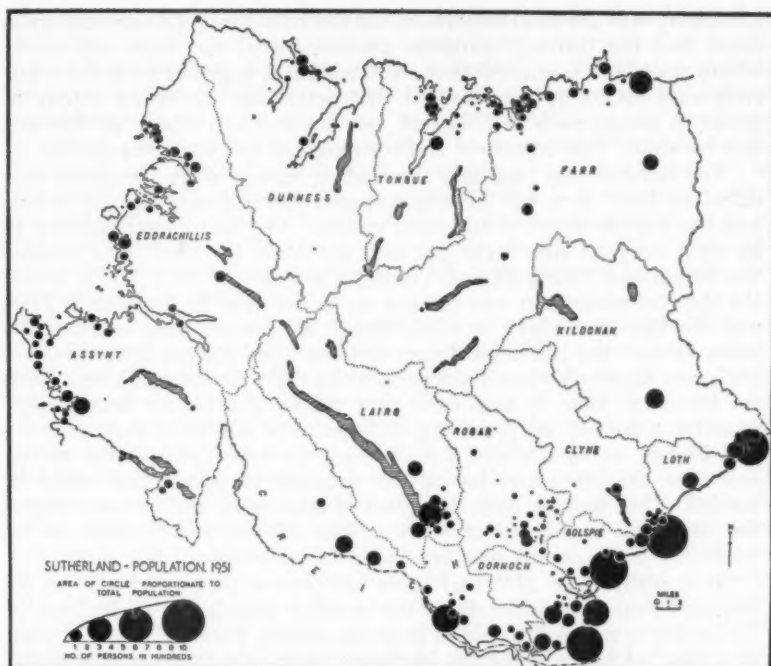
of the former self-sufficiency in almost all goods save those like salt and metal which could not be made locally.

This situation was, however, to be disturbed in the last two decades of the nineteenth century. Horse-drawn vans supplying various goods for household use first appeared in Sutherland, it is generally agreed, in the eighteen-eighties, and they soon increased greatly in numbers, widening considerably both their areas of activity and their range of goods. The pedlars were the chief sufferers from this new development, and much of their business soon disappeared, for the advantages of a service offering greater regularity, greater quantities and a wider choice, were obvious. The penetration of Sutherland began, it seems, from the south about Tain and Ardgay, and to a lesser extent from Caithness in the north. However, the roads, though much better than they had been earlier in the century, were still rather poor, and this, allied with the great distances across the almost uninhabited interior of the county, allowed the simultaneous growth on the north and west coast of the business activities of the trading smacks belonging to the firm of Garden of Orkney.

Between approximately 1890 and 1934, when the last service was withdrawn, these vessels used to make regular trips south as far as Achiltibuie in Wester Ross-shire, calling at all the intermediate points where there was any likelihood of trade. At first the visits were irregular, but a proper monthly service was soon developed with the smacks calling at Bettyhill, Skerray (Tongue), Tongue village, Rispond (Loch Eriboll), Durness, Kinlochbervie, Scourie, Drumbeg, Culkein, Lochinver and Achiltibuie. These vessels were genuine floating shops: that is, they carried a variety of goods, and though naturally concentrating upon the staples in general groceries, drapery, household ironmongery and implements for which there was a regular demand or for which they had received orders, they also carried purely speculative lines corresponding to those which would be held by a large general store of the time.

At many ports of call Garden's actually set up premises which were tenanted by merchants who traded on their own behalf but were assisted by the grant of extended credit. These shops depended almost entirely on supplies brought from Kirkwall by the trading smacks, and then later by a small steamship, the *S.S. Cormorant*, until, with the improvement of the roads to the east of Sutherland and the extensive introduction of motor vehicles after 1918, it became cheaper to rely upon land transport⁸.

The slow and cumbersome horse-drawn vans of the early period, on the other hand, had to carry a more restricted range and therefore were more like the old bagmen. They carried certain goods for which they were reasonably certain of a demand, and had a significant order-business for clothes, foot-wear, furniture, clocks, etc. (thus indicating the breach in the former monopoly of the local craftsmen), but the bulk of their dealing was in bread, butter, cheese, bacon, cereals of various kinds but mainly oatmeal and barley meal sold by the boll bag of 140 lbs, dried fish, and flour. The vehicles themselves were crude "spring" carts—a singularly inappropriate description of their mounting.



TAKEN FROM NOTES ON SURVEY OF LOCAL CONDITIONS BY AC NISIK, COUNTY PLANNING OFFICER
COURTESY SUTHERLAND COUNTY COUNCIL.

Fig. 1 Population of Sutherland, 1951.

The first vans actually run by native Sutherland enterprise and from a Sutherland base probably went into operation in the eighteen-nineties. Certainly the first to travel from Brora is said to have begun in 1896, and at about the same time one began to trade from Ardgay, which, since the building of the bridge at Bonar has served as a business centre jointly with Bonar itself for the adjacent parts of Sutherland. The van businesses were at first extremely informal in their constitution, but the hours of work were necessarily very long, the conditions frequently very hard, and the sheer distances formidable. The field covered by one man from Ardgay in the early years of this century, for example, included Edderton, Strathcarron, Amat, Glen Calvie, Rosehall, Altass, Lairg, Skibo, and all the intermediate places. Similarly vans used to make the circuit of Assynt from Ullapool, which was seventeen miles away from Elphin and Knockan, and thirty-seven miles in all from Lochinver, while journeys of equal magnitude were necessary from Caithness into the north and east of Sutherland.

The supply of goods for this trading illustrates the usual east-west dichotomy of the county. So far as the east and south-east were concerned most of the goods came by rail to Bonar and other stations, and particularly to the inland ones like Lairg, with the exception of a few bulk commodities such as salt and coal (from Durham generally and mostly for the use of the lodges and great houses) which came by sea. Bonar, Littleferry, Brora and Helmsdale all had sea-connections, though

Littleferry was the most important, but the rather inhospitable east coast never had the thriving maritime connections of the west and north, where poor land communications and isolation, together with the relatively easy access by sea, ensured that practically the entire supply of goods to places such as Ullapool, Lochinver, Loch Clash, or Durness was by ship. This continued right through to the inter-war period.

The horse-drawn vans and the trading smacks were inevitably outdated in their turn by the simultaneous development of motor-vans and the improvement of the road system. The first motor-vehicles to be used for mail runs were put into operation by what later became the Sutherland Transport and Trading Company in 1905, but it is said the first motor-van was not put on to the road in Brora until 1916, and the first in Ardgay in 1918, though they were soon followed by many others: the last horse-drawn services were disappearing by about 1927, and Garden's vessels stopped in the early nineteen-thirties. Even so, for some time it was held that where the empty intermediate stretches were not too great—e.g. in Clyne, the inhabited parts of Lairg and Rogart, or in Dornoch parish—the only superiority of the motor-van over the horse-cart lay in the quantity of goods that could be carried. This, indeed, with the speed of movement and to some degree the increased regularity of service, was the chief difference in the trade, for the economy and type of demand remained the same.

It is really since 1945 that there has been a genuine change in the buying habits and demands of the resident population of Sutherland. No longer is the main trade in large quantities, perhaps a boll or more at a time, of basic foodstuffs like meal, often obtained on long credit; now it is in smaller quantities of prepared goods, paid for in cash and bought at frequent intervals. It has as a consequence become a not uncommon complaint that there are too many vans calling too often. This, however, is ungrateful, for the withdrawal of the van services would inevitably greatly hasten the depopulation of the outlying districts, which already is proceeding at an alarming pace.

This leads straight to the heart of one aspect of the Highland problem: the provision of all kinds of services in an area of sparse and declining population, and the interaction between service availability and population potential of the region. How may this be illustrated in the present provision of commercial services in Sutherland?

Firstly, it is quite clear that there has been sufficient real demand to support the great development of all sorts of commercial services in the county since the war: of this, though there is no exact measure, there can equally be no doubt. But it appears very likely that saturation point for itinerant trade has now been reached and that a decline, possibly rapid, may very well develop owing to the shrinkage in many areas of the market available. Loss of population is a century-old feature of most parts of Sutherland, but the commercial effect of this up to the present has been largely masked by the increase in the spending power of the residual population. Much more money has been available in the Highlands in the last twenty years than ever before, partly from external sources (emigrants, subsidies, pensions, etc), and partly from a diversification of employment opportunities consequent upon such enterprises as road improvement, afforestation, and

the construction of hydro-electric and nuclear plants. This has led to a higher standard of living and to demands for new ranges of goods, but it has also been accompanied by a decline in the purely crofting economy and an ageing of the population which has necessarily thrown more emphasis upon bought goods as opposed to those that are home produced. Now that this dependence is a present fact, it would obviously be suicidal to diminish the commercial services which are at the same time its outcome and its support. But it is undeniable that the population of most parts of Sutherland away from certain areas in the south-east, as of the county as a whole, is rapidly shrinking, and therefore that soon there may well be too little demand to support the present level of trading activity.

The costs of starting and running a motor-shop are formidable: a van may cost anything from £900 to £5,000, and it has been calculated that the basic expense of keeping even a small one on the road, inclusive of the driver's wages, is in the region of £1,000 per annum. This takes no account of the capital value of the stock involved, nor of the cost at the shop or warehouse of the time spent in dealing with the van business and stores. It is estimated that a van must have at all seasons a minimum trade of thirty shillings per mile for costs to break even. Since in Sutherland some vans may travel 250 miles or more a week, it will be seen that the total value of the trade must come to well over £400 a week before there can be much thought of profit (this figure would be lower for a small man with no employees). Here the effect is felt of the empty spaces in the centre of Sutherland—from Lairg it is 38 miles to Tongue, 37 to Laxford Bridge, and 45 to Lochinver, and for much of the year the roads of inland Sutherland are liable to be dangerous owing to weather conditions, if not actually closed ⁴.

That these considerations are not merely theoretical may be shown by taking one or two examples. Two grocers in Lairg used to send vans out to Eddrachillis; but, finding that the trade was falling off with the decline in population and that consequently the service was no longer paying (particularly in winter when much of the journey had to be done in low gear and when there could be no certainty of a safe return), they now limit their enterprise to the parish of Lairg itself. Similarly the loss of population in the west caused a bakery in Bonar Bridge to stop its service to Assynt in 1958, though it was renewed temporarily in the summer of 1959. Another business in Ardgay had formerly a proprietor who preferred the vans to the shop and who consequently made himself personally responsible for an intensive and widespread van-service. Now that the business has changed hands the present proprietor prefers to remain in the shop, and has greatly reduced the van activity and would reduce it still further were it not that he feels a certain social duty to maintain a minimum delivery in areas otherwise little served, while at the same time enjoying the incidental advantage of wholesale buying on a larger scale. This also serves to illustrate how, as always in the Highlands, the personal views of an individual may have almost as much to do with the development of an area as the physical or economic controls sought by the academic writer.

There are, of course, other factors influencing the development of

van-traffic in Sutherland which are not peculiar to the county. Business is marginal, and quickly affected by changes which may appear in the national economy. It is alleged, for instance, that the effect of hire purchase and the maintenance of television sets, has diverted a certain amount of money away from the provision trade. This is most felt in the east of the county, where there is the least insulation from the rest of the country: business is less profitable in the west but there are apparently fewer debts and fewer bad debts—not necessarily the same thing. All areas, however, are affected by the seasonal changes of demand, and it has been estimated that during the peak period of July and August demand may be doubled.

In the construction of Figures 2 and 3 only provision merchants were counted, since, broadly speaking, it is only they who run regular van-services with a frequency at any one point on their rounds of one or more calls per week. These schedules are, in general, exact and well-known—an obvious essential for the housewife. As a consequence, the hinterland of any one business is clearly demarcated, and, on the whole, little subject to change. Vans of other types of businesses call usually at intervals less frequent than once a week, and with less regularity. Their areas of custom, though fairly clear and static, are less so than those of the provision merchants, and generally much wider, covering often the whole of the county, and therefore are unsuitable as criteria for regional differentiation.

Van centre	Provision businesses	Other businesses
Thurso	7	2
Brora	4	1
Dornoch	4	1
Bonar	3	—
Golspie	3	—
Lairg	3	—

Table 2. Travelling-van centres in Sutherland and Caithness

The majority of provision merchants operating regular services are those with bakery and grocery goods as their main lines, and these may be classified as general provision merchants. Of these there are twenty-four operating from within the county (including Ardgay), and four coming in from outside. In addition there are six Sutherland butchers with vans and two fishmongers, and five butchers and two fishmongers coming in from outside the county. Of other miscellaneous businesses with van-services (foot-wear, clothing, furnishings, drapery, etc.) there are only three operating from within the county, but at least nine operating from without. In all, then, there are something over fifty firms operating proper van services in Sutherland.

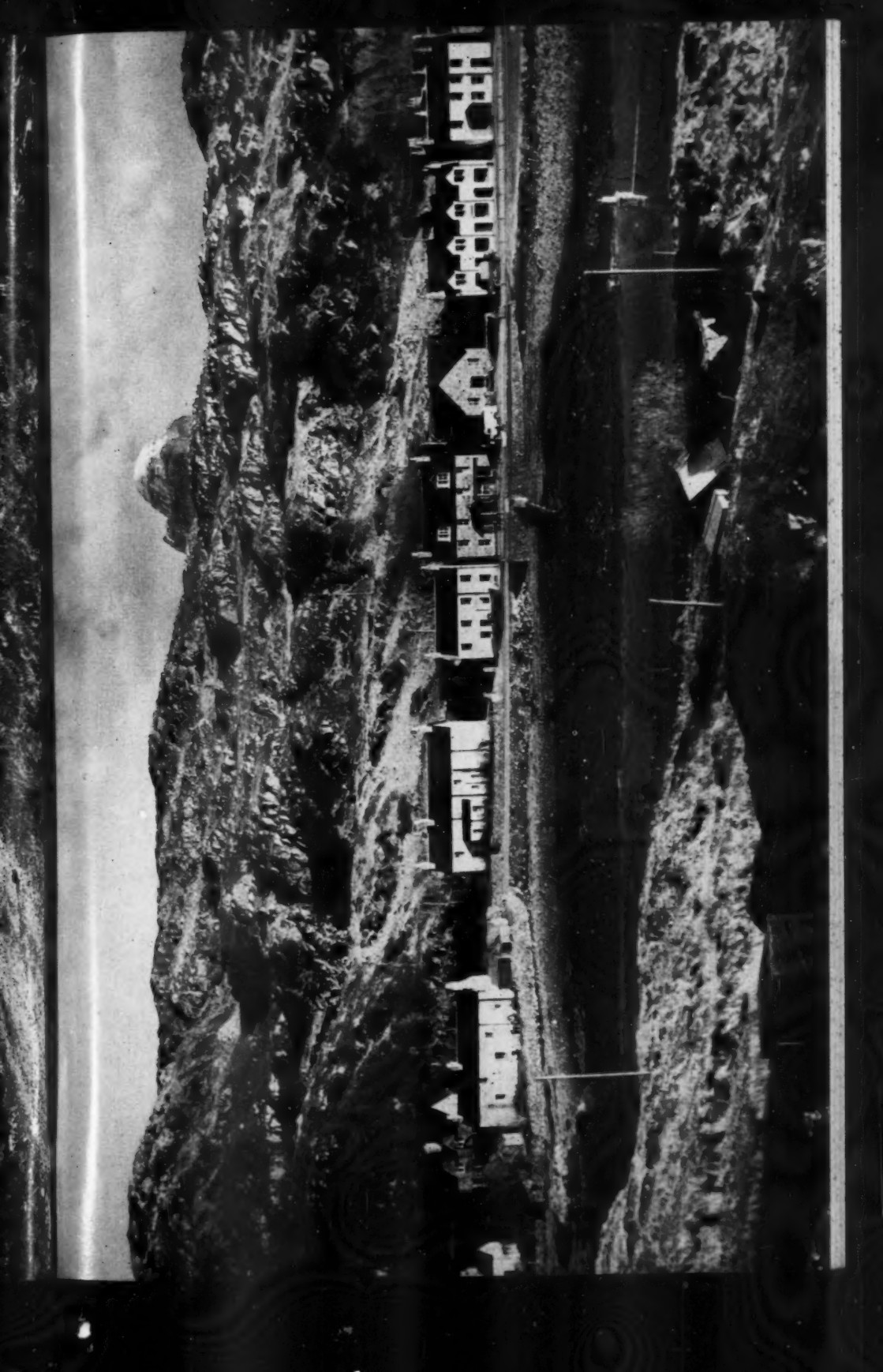
The distribution of the centres for this commerce reflects fairly closely the distribution of population in the north. The major centres (Figure 2—those with three or more provision firms operating vans, apart from any other type of firm) lie only in the south-east of Sutherland, where a comparatively dense population can support twenty-one

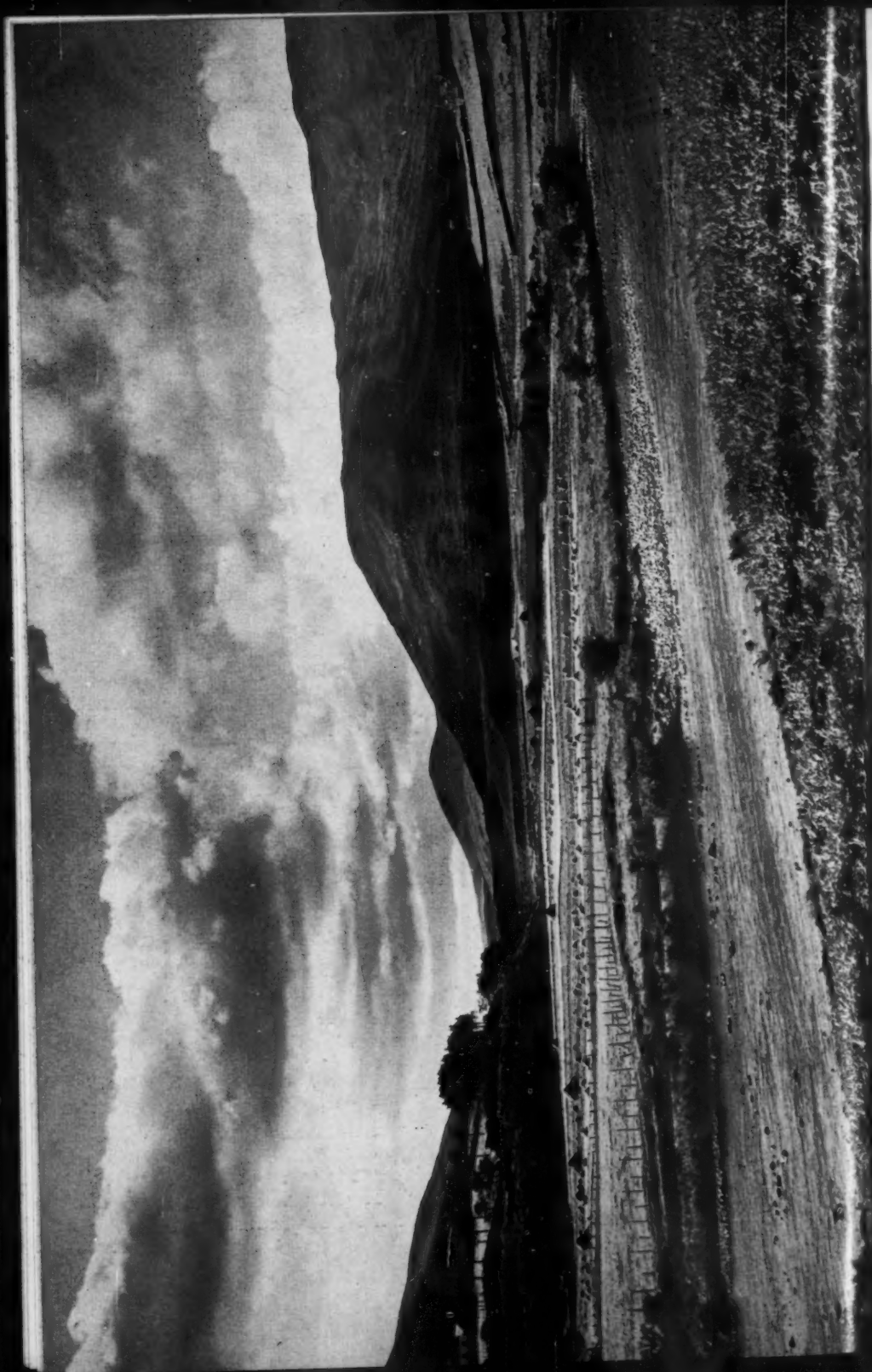
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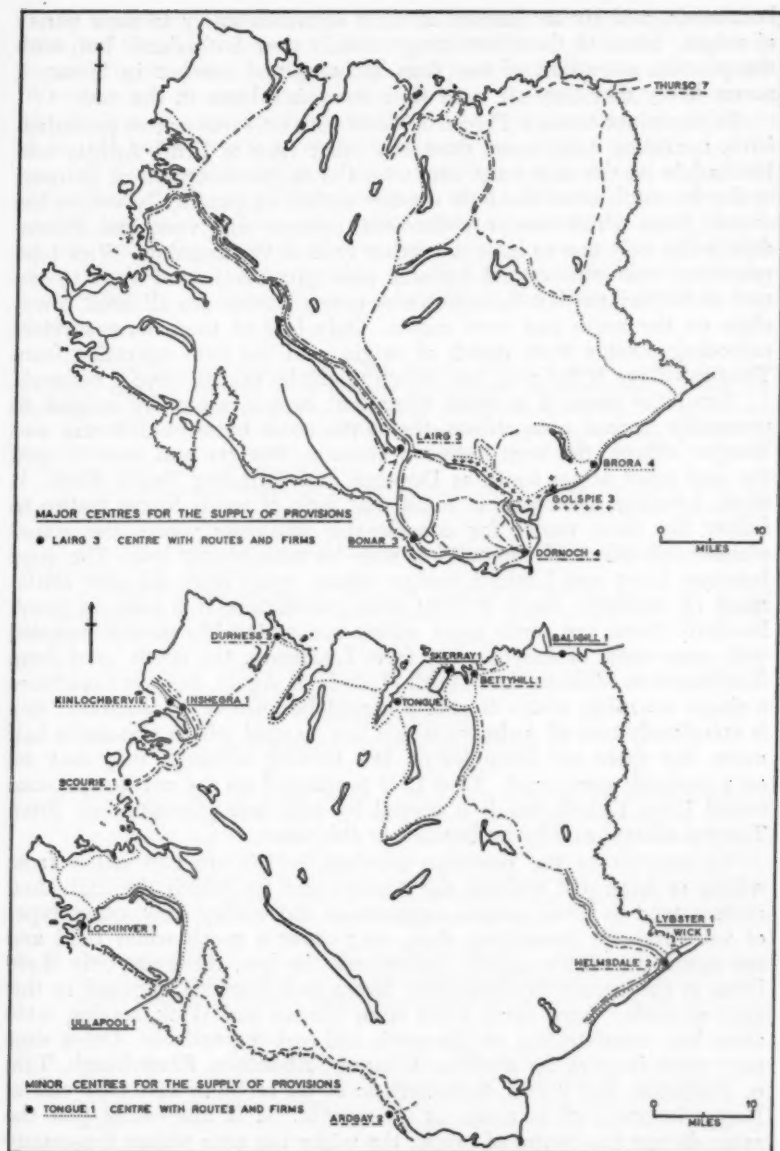


Fig. 2 Major and minor centres for the supply of provisions in Sutherland.

local travelling provision-businesses in all, and in the richer county of Caithness, where Thurso is predominant as the biggest single centre for vans (Table 2).

All these concerns have a strong interest in their immediate neigh-

bourhoods, and six are limited in their activities solely to their parish of origin. Some of the others range widely over Sutherland, but, with the possible exception of one firm in Lairg and another in Bonar, it seems likely that they all have their economic basis in the east.

Of the minor centres (Figure 3—those with only one or two provision-firms operating vans, apart from any other type of firm), Ardgay and Helmsdale on the east coast are, with the single exception of Durness in the far north-west, the only centres within, or practically within the county, from which two provision-firms operate with vans, and Helmsdale is the only one to have any other type of van running. Wick (one provision, two others) and Lybster (one provision) send vans to the east of Sutherland, but the other nine minor centres are all small townships on the north and west coasts. Only half of these have services extending outside their parish of origin, and the firm operating from Tongue village is the only one which might be said to have a network.

From the maps it is quite clear that certain areas are subject to unusually intense competition—the north coast between Kirtomy and Tongue village, the west between Durness, Sheigra and Scourie, and the east coast as far south as Dornoch and including Strath Fleet. It must, however, be borne in mind that lack of roads forces traffic to follow the same routes for considerable distances where the actual commercial effect of competition may be surprisingly low. The road between Lairg and Laxford Bridge, where, apart from the new settlement of Achfarry, there is very little population, is a case in point. Similarly there are some areas which are noticeably poorly supplied with vans—most of Assynt away from Lochinver, the north coast from Sangomore to Melness, and Strath Halladale. Again, there is sometimes a single township which is poorly served because of its isolation; this is notoriously true of Ardmore which has no road within two-and-a-half miles, but there are examples no less striking although they may lie on a perfectly good road. Thus Laid is situated on the north-coast area round Loch Eriboll but it is served by only one provision-van (from Tongue village) and by no butcher or fish van.

In contrast to the provision services, which are run either from within or from just without the county, and for which the individual centres tend to serve certain segments of the county only, other types of van (drapery, furnishing, shoe, etc.) cover a much wider field and are mostly run from outside Sutherland. In fact, there are only three firms in the county at Helmsdale, Brora and Dornoch engaged in this type of trade. Some firms trade from Thurso and Wick, serving wide areas but concentrating on the north and east respectively. Other vans may come from as far afield as Glasgow, Aberdeen, Fraserburgh, Tain or Edderton, but it is a characteristic of all of them that they call at longer intervals of as much as six months. It is interesting that the more distant the centre of origin, the wider the area within the county served. It is also interesting to note that the place of the pedlar has been taken almost entirely by Indians and Pakistanis. The service they provide is important, but the development of mail-order firms and the much greater ease of visiting the commercial centres from even the most isolated parts of Sutherland have much reduced the former dependence upon the itinerant businesses of this sort.

It is possible, therefore, to trace in outline the modern growth of itinerant trade in Sutherland, from small beginnings in the nineteenth century to its present widespread and prosperous—if precarious—state. Whether it is viewed as a specifically rural development, or as one of the devices to extend urban standards of service to the country areas, it is still quite clearly a vital feature of the present economy of the county. The questions of population and itinerant trade are very closely linked and if the population continues to decline the trade also must almost inevitably follow suit, with further repercussions upon the life of the remaining people. It may not be long now before it becomes clear whether the future pattern will be one perhaps of advance but more possibly of stability, or—as seems all too likely—of final, fatal decline.

¹ In two or three cases population figures for very small settlements were gathered together as one entry for the appropriate administrative district, thus causing an appearance of greater nucleation than is justified e.g. there was only one entry for Kildonan apart from the Helmsdales on the east coast, although the population in fact is scattered all along the Strath. Generally, however, the map gives an exact and accurate picture.

² The earliest clearances in Sutherland had taken place by about 1760 and the last occurred in 1872, but the period of the great "Sutherland Clearances" was approximately 1809 to 1820.

³ Compiled from information kindly supplied by R. L. Johnson, Esq., for R. Garden, Ltd., Kirkwall.

⁴ In 1958/9 Sutherland spent just over £20,000 on sanding and snowcutting. This approaches 20 per cent of total expenditure for that year of the County Roads and Bridges Surveyor's department.

SUTHERLAND

Plates 1-4, opposite pp. 152/153

- Pl. 1. Nedd (at head of Loch Nedd, Eddrachillis Bay, W. Sutherland) looking south-east. Typical crofting township strung along single-track road (B 869). Ice-scoured and roughened, low plateau (500 ft.) on Lewisian Gneiss precludes cultivation and carries only heather moor, and on steeper valley-sides, scrubby deciduous (oak, birch) woodland. In background, steep cliff-like west-facing scarp of Quinag (2448 ft.) formed of horizontally stratified Torridonian sandstone, capped on peaks with Cambrian quartzite. *A. D. S. Macpherson*
- Pl. 2. On road (B 869) between Nedd and Kylesku Ferry, looking south-east along west-facing scarp of Quinag. Typical of much of Sutherland. Narrow winding road crosses low plateau where ice-scraped knolls alternate with ill-drained peaty hollows. *J. Allan Cash*
- Pl. 3. Lochinver (at head of Loch Inver), W. Sutherland, looking south-east. This small service centre is confined to edge of Loch Inver and backed by typically ice-scoured, 'mammilated' plateau of Lewisian Gneiss, with Suilvan (2399 ft.) an upstanding mass of Torridonian sandstone with white capping of Cambrian quartzite. *J. Allan Cash*
- Pl. 4. Strath of Kildonan, Helmsdale River, E. Sutherland, view approx. one mile S.E. of Kildonan, looking north-west. Typical of the wider straths of E. Sutherland which dissect upland of Moine schists. Smoothly convex slopes contrast with those of west. Strath with flat haughland (in foreground) bordered by higher terraces (up to 50 ft. in background) provides one of the natural route ways from east coast at Helmsdale, to the north and west coasts of Sutherland. *J. Dixon Scott*

THE IGLOOLIK ESKIMOS

W. GILLIES ROSS

BETWEEN Baffin Island and the mainland of Canada is a sizeable body of water called Foxe Basin, which extends over 300 miles southward to the mouth of Hudson Bay. In the northern part of this basin, near the place where polar waters enter by the narrow Fury and Hecla Strait, is the small island of Igloolik. There is here a Hudson's Bay Company trading post upon which over 400 Eskimos of the surrounding area depend for the conveniences of modern Eskimo life, chiefly ammunition, sugar, flour, salt, tea and tobacco. There is also a Roman Catholic mission, although a number of the natives have been baptised by the Anglican Church, which intends to establish a mission here also. Both the mission and the post were built within the last twenty-five years, demonstrating that this area has had little contact with white man until quite recently. (See Fig. 1).

Although the post and mission are modern, the island of Igloolik has long been a focal point for the Eskimos of the area. Captain W. E. Parry, the first European to reach Igloolik, wrote in 1823, "... Igloolik certainly appears to be one of their principal rendezvous, forming, as it were, a sort of central link in the very extensive chain of these peoples' peregrinations ¹". And one century later Mathiassen called it "the most important settlement in the area ²". Furthermore, the recent examination of archaeological sites on the summit of the island by Jorgen Meldgaard of the National Museum of Denmark has disclosed the remains of an old Sarquag culture, whose age has been scientifically determined as 3,700 years, plus or minus 300 ³.

This pre-historic community, now at an elevation of 150 feet above sea level, once enjoyed a beach location near the water, for Eskimos then, as now, secured their living from the sea. It is due to the post-glacial emergence of the land, following the ablation of an enormous weight of Pleistocene continental ice, that such sites have been preserved for study. In areas of submergence the evidence of human occupation is lost. Along the east coast of Melville Peninsula and on Igloolik Island the rising of the land has left a coastal landscape consisting of tiers of raised beaches composed of limestone boulders, pebbles, or gravel. It is on the beach ridges that Eskimo dwellings have usually been located in the past and present. Today the Igloolik Eskimos erect their summer tents on seaside beaches; winter sod-houses are placed a short distance back from the shore. On raised beaches between elevations of eight and twenty feet occur the house mounds of the Thule culture, dating back 600 years or more. At an elevation of from twenty to seventy feet the ruins of the Dorset culture may appear, dating back about 2,000 years; and above seventy feet the older Sarquag finds have been made. From the Carbon-14 dating of the Igloolik Sarquag material (3,700 years) and a measurement of the altitude (160 feet) we can calculate that the land has risen, in relation to the sea, at an average rate of about 0.4 feet a year.

The most remarkable past culture in this area was perhaps the Thule. These people, like the present Igloolik Eskimos, were hunters

of marine mammals. But they concentrated on the whale, whose gigantic bones they employed to reinforce house-walls, support skin-roofs, and fashion dog-sleds. Their weapon was the harpoon, their water-vehicle the kayak; somehow they managed to kill whales from these dainty craft, using primitive hand-thrown weapons. To provide manpower for hunting and handling, communities were relatively large; the distinctive circular mounds of their houses remain today as welcome interruptions to the uniformity of the skyline on the low east-coast of Melville Peninsula and on the south-east corner of Igloolik Island.

The material discoveries in pre-historic sites are in close accord with legends still existing among the older Eskimos. The present natives are well acquainted, by word of mouth, with the way of life, the mode of dress and shelter and the hunting exploits of their forefathers, the Thule people. The record of the earlier Dorset culture also persists in folklore; these people are known as "Tunit" and a variety of legends describes their great physical strength. Since the examination of pre-

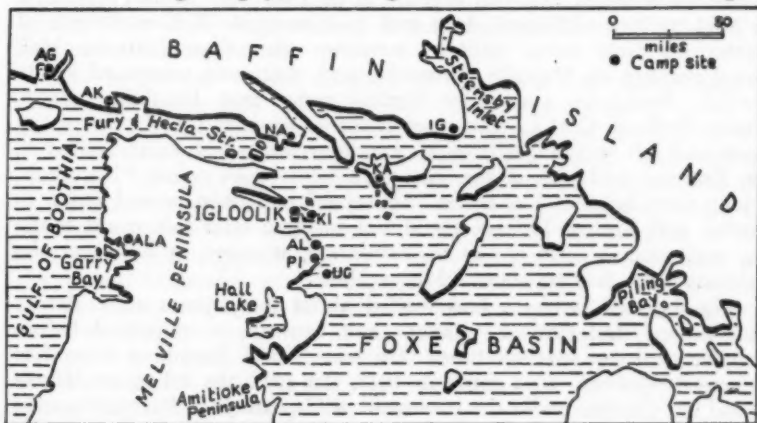


Fig. 1. Map showing approximate limits of Igloolik Eskimos. Campsites: Ag - Agu; Ak - Akiminerk; Al - Alnagmerk; Ala - Alangardjuk; Ig - Iglurdyuar; Ka - Kapuivik; Ki - Kikertardjuk; Na - Nauyaraluk; Pi - Pingerqualik; UG - Uglit.

historic sites has revealed that the Dorset people did not possess dogs, but pulled loaded sleds themselves, the stories of their strength seem to have a basis in fact. The Tunit hunters are said to have provided for their own comfort while spending cold, patient hours waiting over seal holes in the sea-ice by placing a small oil-lamp between their feet; the heat rose into the tent-like canopy of a loose knee-length parka and kept the body warm.

The first explorer to meet the Igloolik Eskimos was Captain W. E. Parry, R.N., in his second voyage in search of a Northwest Passage in 1821-23. In late summer, 1822, his two ships *Fury* and *Hecla* sailed through the narrow island-studded gap between Melville Peninsula and Baffin Island, and reached Amherst Island. From the careful, methodical exploration already done by small parties on foot and sledge, it was apparent that this strait was the only possible western passage south of Baffin Island. But beyond to the westward stretched continuous

ice, through the strait and well into the Gulf of Boothia. Parry wrote in his journal in early September: "Notwithstanding, therefore, the present uncompromising appearance of the ice, I had no alternative left me but patiently to await its disruption, and instantly to avail myself of any alteration that nature might yet effect in our favour ⁴".

Parry waited anxiously for the remaining ice to break up, but it would not. By the third week of September the open water was beginning to refreeze, and he turned back in defeat. The two ships returned to Igloolik Island and were soon frozen into the ice of Turton Bay, where they passed the winter. In the following summer a second attempt at the strait was discouraged by the appearance of signs of scurvy among the crew; putting the health of his crew above all other considerations, Parry headed back immediately for England.

It was nearly half-a-century before another white man visited the Igloolik area. This was C. F. Hall, an American travelling in search of the unfortunate Franklin expedition of 1845. He came to Igloolik in 1864 to buy additional dogs and to investigate Eskimo stories of mysterious stone cairns built by someone other than Eskimos. Hall found nothing on Melville Peninsula, and continued westward across Boothia Peninsula, eventually finding some true Franklin relics ⁵. Father Trébaol, O.M.I., who headed the mission at Igloolik for many years and left in 1957, tells of his bewilderment some years ago when the Eskimos told him of the visit of a white man called "Mistahok" a long time before. The name "Mistahok" had been passed down in stories, and Father Trébaol could not imagine who this could really be, until one day, in a sudden revelation, it came to him that the Eskimos were talking about "Mister Hall".

The Igloolik Eskimos had waited about forty years after Parry's visit before Hall arrived; another half century or so passed before another explorer reached them. He was Alfred Tremblay from Lac Beauport, Quebec, who came in 1913. In 1912 the schooner *Minnie Maud* left Quebec under the command of Captain J. E. Bernier, headed for northern Baffin Island to follow up gold rumours. Two other similar expeditions had already sailed. The ship reached Pond Inlet, and although no trace of gold was found, there was good fishing and fur-trading. During the subsequent winter, while the 85-foot schooner remained frozen in at Albert Harbour, Alfred Tremblay made some remarkable journeys away from the ship by dog-sled with two Eskimo companions. Travelling in Eskimo style, "with barely any equipment worthy of the name save for his Ross rifle and Colt Automatic..." he covered large distances, although perhaps less large than his book, *Cruise of the Minnie Maud*, proclaims. He reached Igloolik via Admiralty Inlet and the Gifford River and made two trips from there, one to Agu and one to the vicinity of Hall Lake, before returning overland to Pond Inlet. He then admitted, "I was very thin when I returned from my hard journeys and my head often ached badly from the strain and hardships I had undergone. Abscesses formed at the foot of my teeth in my lower jaw and I suffered agonies from toothache ⁶".

Several years after Tremblay's visit the Igloolik area was traversed by Therkel Mathiassen and Peter Freuchen of the Fifth Thule Expedition (1921-24). The former studied the archaeology and the material

culture of the Igloolik Eskimos. The thorough work done by this fine group was timely, especially in Foxe Basin, because it preceded the establishment of the Catholic mission and the Hudson's Bay Company post at Igloolik, which ushered in a new way of life. The Fifth Thule Reports on the Igloolik Eskimos describe them before the hunting economy was at all modified by organised fur-trading, government aid, or medical supervision.

PRESENT PATTERN OF SETTLEMENT

The principal characteristic of Eskimo settlement in northern Foxe Basin is dispersion. Communities are generally small, numerous, and spread out; they are also mobile. Unlike most North American Indians, who often found advantages in numbers, the Eskimos receive no special advantages in banding together in large groups, at least not since the days of the whale hunters. Such is their dependence today upon limited quantities of animal life for food that in an overcrowded locality they stand little chance of survival, due to the depletion of fish and game resources.

The awareness of the Eskimos of the need for conservation is interesting. Some may question that this awareness exists at all, in the light of various instances of overhunting (notably of caribou) and of wasteful hunting (shooting seals which sink before they can be reached). They may argue that before the introduction of fire-arms, the Eskimos simply were not capable, in terms of weapons, of violating the laws of conservation. However, the distribution of Eskimos in the area of Igloolik suggests that they may, in fact, have been and still are acutely conscious of the danger of overhunting in one locality. Captain Parry remarked in 1823, "It appears probable, indeed, that these wandering people are in the habit of residing at their various stations only at particular intervals of time, perhaps with the intention of not scaring the walruses and seals too much by a very long residence at one time upon the same spot".

The camps of the Igloolik Eskimos are mostly concentrated in a zone which curves around the top of Foxe Basin, from Amitioke on Melville Peninsula to Piling on Baffin Island (Fig. 1). This zone, in its simplest form, may be regarded as an extended coastal region which has at its centre the waters of northern Foxe Basin, rich in seal and walrus. The majority of present-day settlements are concentrated in the western half of this zone, owing partly to the fact that along the coast of Melville Peninsula the water remains unfrozen during the winter. There is always drifting ice of some sort; but the current flowing south, parallel to the coast, manages to prevent the extension of land-fast ice more than a few hundred yards out from the shore. This area of open water enables the hunting of walrus to continue during winter months, and is therefore a strong locational factor for Eskimo camps. In addition to this attraction there is the fact that the east side of Foxe Basin lacks sufficient resources of seal and walrus to attract permanent settlement; this in turn seems due to a shortage of planktonic life in the shallow waters.

Another factor influencing the settlement of the area is the distribution of caribou. There was a time when the caribou were numerous

throughout the settlement zone; the bones of these animals are commonplace in the area, usually associated with old tent-rings, and early explorers have reported them in numbers. But today the caribou are more or less confined to two main areas, the interior and west coast of Melville Peninsula, and the low area of Baffin Island bordering the eastern side of Foxe Basin. They have been thinned out and expelled from the coastal regions by the use of firearms and forced into a zone beyond that containing the majority of camps. At present the caribou population is probably in a state of balance, because it is just far enough away from the Eskimos to make their hunting parties infrequent. A natural adjustment to the increased killing-power afforded by rifles has been made, in the form of a reduction in numbers and a more restricted distribution.

The eastern coast of Foxe Basin, although generally unpopular for settlement of any permanence, has at times supported camps of some size. Father Trébaol tells of a journey in 1941 in which he visited a camp of about seventy people at Ignerit; they had gone there to hunt caribou and remained all winter. At the same time there was a family living at Ege, and another large camp at Piling. This was exceptional, however, and this area is quite unsuitable for settlement of long duration. Seals and walrus are scarce, and the caribou movements are irregular; there are many stories of families starving here when the caribou herds did not appear.

When the Hudson's Bay Company post and the Roman Catholic mission were established on Igloolik Island, the location at the head of Turton Bay offered the advantages of a sheltered and reasonably deep harbour, suitable for the unloading of the annual supply-ship, or for the landing of seaplanes in summer. For the Eskimos, however, the site is less favourable than somewhere nearer the east coast, where the distance to the floe-edge in winter is roughly ten miles less. The floe-edge is the popular name for the seaward margin of the land-fast ice; beyond it lies open water containing drifting ice-blocks and floes which are shunted around by the wind. A considerable area of open water exists throughout the winter in southern Foxe Basin, because of the current of polar water which enters from Fury and Hecla Strait and flows south, parallel to the east coast of Melville Peninsula. It is along the floe-edge on the border of this open water that walrus are hunted in the winter. When a wind blows from the southern sector, walrus usually accompany the ice floes which are blown north against the floe-edge. At these times the Eskimos travel by sled to hunt in the confusion of ice, using rifles and harpoons.

The importance of walrus meat in the economy of the Igloolik is considerable. Its chief use is as dog feed. Like most inhabitants of the Eastern Arctic the Igloolik Eskimos possess large dog-teams, and during the low winter temperatures a team of a dozen working-dogs requires about 100 pounds of meat a day. The walrus are therefore hunted throughout the year and many are cached under rocks for winter use. In summer they are hunted from boats slightly farther to the south.

Since the floe-edge is where walrus are taken in the winter, its position is of great importance to the Eskimos. On Igloolik Island the serious hunters prefer to spend their winters at Kikertardjuk rather

than Igloolik itself, because it is closer to the floe-edge. Kapuvik is well situated, and the camps along the Melville Peninsula coast from Alagnerk to Amitioke are also within easy reach of the open water. Mathiassen reported, "As soon as the sea begins to freeze up the natives gather on Iglulik, where they hunt the walrus throughout the winter. According to the position of the floe-edge, Iglulik, Pingerqualik, or Uglit Islands are the favourite settlements"⁸.

The position of the floe-edge varies. A northerly wind may break it up and send pieces of ice sailing southward; a southerly wind may return those blocks and floes as projectiles to bombard the floe-edge and disturb it further. But its average position is remarkably stable during the winter, and from one year to the next. It seems to have varied hardly at all from its position as described by Parry (1822-23), Hall (1868), Tremblay (1913), and Mathiassen (1922-24).

Walrus rarely penetrate westward into Fury and Hecla Strait, and therefore the Eskimos who occupy the small sites of Akiminerk and Nauyaraluk near Cape Hallowell, and the large settlement of Agu farther west, have an economy noticeably different from that of Foxe Basin. By necessity they place much greater emphasis on caribou, seal and fish. There is, fortunately, a large seal population along the strait; in June 1957, from a moving sled, I counted more than eighty visible on the ice at one time. For caribou these Eskimos move south along the mountainous western side of Melville Peninsula, often spending some months at the camp of Alangardjuk, in the Garry Bay area. For purposes of administration, however, these people are included among the Igloolik Eskimos; births and deaths are recorded at Igloolik, and family allowances are distributed—in the form of 'Pabulum' and powdered milk for the children. Commercially too they are united with the Foxe Basin population, for it is to Igloolik that they bring their furs annually to trade for ammunition and food.

Another settlement which makes some adjustment to compensate for its distance from the walrus herds is that of Nauyaraluk. There is evidence that the Eskimos here use birds to a fairly large extent in their diet, hunting them on various nearby islands where geese and ducks abound. They concentrate also on seal hunting, and make occasional sorties for caribou.

The past quarter-century has been a time of rapid change for the Igloolik Eskimos. This short period has seen the establishment of a trading post and a mission at Igloolik, as well as annual visits of the supply ship, frequent R.C.M.P. patrols, several exploratory and scientific expeditions, and the construction of some DEW-Line radar sites in the area. While other areas in the Canadian Arctic have experienced the same influences, they have usually had a longer period of time in which to adjust to increased contact with civilised man.

The most recent change has been the construction of a school at Igloolik. Two years ago there was no school: the Catholic missionaries spent much time with the children, teaching them in French, as they spoke very little English themselves, and each year a fortunate group of about eighteen youngsters was sent 400 miles south to the government hostel-school at Chesterfield Inlet. The position of Igloolik as a focal point of northern Foxe Basin and the trading centre of over 400 Eskimos

argued strongly for the erection of a school there. This was finally accomplished in 1959. Education still faces serious problems, however. One is the nomadic nature of Eskimo life which results from dependence on hunting and trapping. Another is the choice of a realistic curriculum which will benefit the natives in their customary way of life. A third is the provision of skillful teachers.

How have the changes of the last decades affected the Igloodik Eskimos? The Hudson's Bay Company post has made the trapping of fur-bearing animals an important part of their life cycle, and has been responsible for the supply of certain foods, utensils, weapons, ammunition and fuel. Some jobs have been created around the post, such as carpenter's helper and store clerk, which attract a few families to a year-round existence there. The supervision of health has been improved, in particular the detection of tuberculosis. A small measure of education has been provided, as well as a greater exposure to the peculiar ways of the white man.

Most disturbing, perhaps, was the construction of DEW-Line sites. One of the largest, a supplier of smaller sites to east and west, was located only fifty miles from Igloodik and was frequently visited by Eskimos. The spectacle of such a large camp, with its bizarre radar equipment towering over scores of tent-huts, its assortment of construction machines and vehicles, its large number of workers, its incessant air-traffic and its large-scale sea-lift during late summer, must have caused some bewilderment to the natives of the area, who had previously counted it a curiosity to see any stranger besides the trader and the mission priest.

During the construction phase, from 1955 to 1957, there were at times more than 300 workers at this site. The atmosphere was dynamic. There was noise and movement, dirt and waste. The garbage dump was on the sea-ice just south of the site, and visiting Eskimos usually made camp nearby to enable their dogs to obtain a free meal at the dump. The Eskimos themselves often extracted various articles such as discarded tents and canvas; metal rods which could be sharpened and used for spearing seals at the breathing holes in spring; metal containers for collecting snow or water, or for cooking; wooden boxes which would serve as sled boxes to store stove, tea, ammunition, and other articles used frequently when travelling; pieces of wood for general carpentry; and bits of every kind of wire for a variety of purposes. In June 1957, I travelled from Igloodik to the site with a young Eskimo who had made every one of his dog-traces from bits of scrap wire. It kinked, snarled and broke time and time again. Within a few miles of the site the main strop parted and the entire team raced away gleefully over the ice towards the dump, leaving us to walk. The wire was obviously no substitute for seal skin, but it was much easier to get. The dump was a great attraction, especially to the poorer type of Eskimo; it was also an offence against principles of sanitation. New methods of disposal were arranged.

The pattern of Eskimo settlement in northern Foxe Basin was virtually unaffected by the DEW-Line construction. The usual cycle of hunting and trapping continued. The site mentioned above hired none of the local natives, although several 'more civilized' Eskimos

from Repulse Bay were employed to operate machinery and on unskilled jobs. There were a few families at Kimerktorvik who gave up hunting in favour of making mittens and slippers for souvenir hunters at the site, bartering for cigarettes, tea, and occasionally some highly unusual item such as a case of fruit juice or a crate of Florida oranges. However, these families were the only ones to alter their life cycle by becoming temporary parasites on the site. The construction phase ceased in 1957. Maintenance and operation of the sites is now carried on by small groups of well-trained men, living in permanent quarters and having less contact with the Eskimos.

The dependence of the Eskimos of this area on fur-trading gives them less time for hunting than formerly. On the other hand, the use of rifles makes their hunting more efficient, so that less time is needed. The hunting of walrus, seal and caribou remains the basis of their existence, and the location of their camps today differs very little from that recorded by early explorers. The principal factor in their distribution and seasonal movements is still the occurrence of game, particularly the marine mammals. Exploration, missionary work, fur-trading, and defence construction have opened up Foxe Basin, but the natives still prefer their customary way of life, and have altered it but slightly.

¹ Parry, W. E. *Journal of a Second Voyage for the Discovery of a North-West Passage*. . . . London, 1824, p. 451.

² Mathiassen, T. *The Material Culture of the Igloolik Eskimos*. Report of the Fifth Thule Expedition 1921-1924, Copenhagen, 1927, vol. 4.

³ Meldgaard, J. Dorset Kulturen, *Kuml*, 1955. Also Origin and Evolution of Eskimo Cultures in the Eastern Arctic, *Canad. geogr. J.*, Feb., 1960.

⁴ Parry, W. E. *Op. cit.* p. 339.

⁵ Hall, C. F. *Narrative of the Second Arctic Expedition Made by Charles F. Hall*. . . . Government Printing Office, Washington, 1879.

⁶ Tremblay, A. *Cruise of the Minnie Maud*. Quebec, 1921, p. 238.

⁷ Parry, W. E. *Op. cit.*, p. 450.

⁸ Mathiassen, T. *Op. cit.*, p. 31.

GEOGRAPHY APPOINTMENTS IN SCOTTISH UNIVERSITIES

1960

- ABERDEEN : *Visiting Lecturer* — Professor Robert S. Funderburk of the Division of Social Sciences, Central Washington College of Education, Ellensburg, Washington.
- EDINBURGH : *Assistant* — R. P. Kirby, Research Assistant, McGill University Montreal.
— R. A. Neilson, Teaching Assistant, University of Wisconsin.
- GLASGOW : *Lecturer* — John S. Keates, Chief Cartographer, Esselte Map Service, Stockholm.
Assistant — J. D. McQueen, Research Student, University of Glasgow.

THE BRITISH COLUMBIA NATURAL RESOURCES CONFERENCE

AN APPROACH TO CO-ORDINATED REGIONAL DEVELOPMENT

P. D. McGOVERN

One of the primary aims of the British Columbia Natural Resources Conference is to bring together specialists in various subjects. This is a matter of more than local interest, for the growing number of specialists in narrowly defined subdivisions of knowledge is a universal feature of this age. Even in geography, which is probably the most comprehensive of disciplines, the current trend is towards specialisation in physical, economic or social geography with further divisions within each group. Similarly there are various kinds of physicists, engineers, agriculturalists and economists.

This disintegration is, of course, the outcome of the rapid developments in the physical, technological and social sciences which have provided both the opportunity and the necessity for specialisation. It is further obvious that the rapid advance on all fronts would not have taken place without this. However, in spite of the great benefits which have accrued, the proliferation of specialists in jealously guarded 'sub-subjects' is raising serious problems. Communication between workers in different disciplines is increasingly difficult, important inter-relationships between one subject and another are virtually ignored, and much time and money is wasted on unco-ordinated attacks on problems of common interest.

The unfortunate consequences of extreme specialisation are particularly evident in the sphere of regional development. Many specialists are necessarily involved in any attempt to find effective solutions to a region's problems or the optimum use of its resources, and co-ordination is obviously essential for the preparation and implementation of an efficient development programme. Without this there will be contradictory policies for the development of power, fisheries and recreation, forestry and wildlife, agriculture and urban settlement, transportation and industry. Thus all regions, whatever their stage of development may be, stand to gain more from a comprehensive approach to their problems than from the unco-ordinated endeavours of a large number of experts.

Fortunately regional development provides a basis for comprehensive thinking as well as the necessity for it. In coping with regional problems specialists are forced to recognise each other's existence because of the relatively restricted area in which they are working. Thus the division of a country into planning regions with distinctive characteristics, resources or problems provides a series of focal points, and also a framework for the co-ordination of the research and development programmes of public and private agencies.

Effective co-ordination is hard to achieve unless there is one overall authority with power to prepare and enforce a comprehensive development plan. But without going this far various steps might be taken to bring specialists into closer contact with each other, and thus acquire a better appreciation of the relationships between their subjects and the common goals which are being pursued. To this end there is much to be said for an annual conference of all the groups concerned with various facets of the development of the region.

The form of such a conference will depend on the type of region, its culture and its administration, but much may be learned from experience elsewhere. Consequently a brief account of the evolution and methods of the British Columbia Natural Resources Conference may be of some interest to other regions. It may also be of particular interest to geographers for its contribution to comprehensive thinking, and as an indication of development trends on Canada's Pacific coast.

The salient features of British Columbia are its large area, small population and wealth of undeveloped natural resources. The latter include productive soils, vast coniferous forests and grasslands, large deposits of metals, petroleum and natural gas, off-shore fisheries and many large rivers and lakes. In addition, abundant wild-life and a variety of attractive terrains and climates give the Province considerable recreational potential. On the other hand generally rugged topography, heavy rainfall in the coastal belt, low winter temperatures in the interior, and large non-habitable areas make the development of the proven resources a difficult and costly undertaking, with a consequently heavy demand for capital and labour. Efficient use of these relatively scarce factors is, therefore,

essential and for this a continuous choice has to be made between alternative development projects.

Further problems arise because various resources are found in the same land areas and water bodies, and the development of one resource may destroy or otherwise affect the other. For example, the construction of hydro-electric power facilities on some of the Province's rivers would damage the valuable commercial salmon fisheries and interfere with wildlife preservation. Consequently a comprehensive view is needed of the pros and cons of harnessing some other river, or using some different form of energy, or developing the site in a manner which would permit multiple use.

Conflicts such as these came to the fore in British Columbia in the late nineteen-forties with the post-war boom in resource development. The prime need was for adequate information on the work and programmes of the many agencies concerned with resource use, and for closer liaison between the specialists in the various fields. Accordingly in February 1948 one hundred delegates from business, government and university were invited by the Minister of Lands and Forests in the Provincial Government to meet together "to determine whether an annual conference might contribute to the conservation of natural wealth in British Columbia". This was the first session of what was later called the British Columbia Natural Resources Conference, and it was the prelude to a continuing series of regular annual meetings.

These have been held in Victoria, the capital city of the Province and the principal government centre. So far there has been no strong pressure to meet in Vancouver, the major commercial and university centre, or in any other part of the Province as an alternative to Victoria. However, in 1959 a change of venue did take place and the conference met at the resort of Harrison Hot Springs seventy miles east of Vancouver. In view of the settlement pattern in British Columbia it is unlikely that meetings will be held far from the south-west corner, although delegates come from all parts of the Province as well as from other parts of Canada and the north-west United States.

The initial conference in 1948 was a one-day meeting. In 1949 the duration was extended to two days, and as from 1952 to three days. The number of delegates increased from 100 in 1948 to 200 in 1949 and to 250 by 1954, and has remained at this level since then. The number and range of groups represented at the conference has also increased to the extent that delegates now come from several federal, provincial and municipal government departments, from university departments in the physical, biological and social sciences, from industrial and commercial companies, utilities and transportation. By another classification the conferences have brought together the professions and the administrators, management and labour, exploitationists and conservationists, experts and laymen.

At the initial meeting in 1948 the aims of the conference were declared as follows: to make more widely known the plans and actions of all agencies concerned with resource use; to promote personal relations between specialists in various fields; to promote closer research and administrative relations between agencies. Thus in these early days the conference was seen primarily as an opportunity for specialists to become acquainted with each other and with work that was being done in related fields. This has continued to be one of the basic functions, but over the years increasing emphasis has been placed on research and educational activities and on public relations. The outcome of the discussions has been a redefinition of the basic objectives in the following terms; to help co-ordinate the interests of all industrial, university, government and private agencies that are concerned in the conservation of natural resources; to explore the status, problems and inter-relations of the resources of soil, water, agriculture, fisheries, forestry, mining, power, wildlife, recreation and people; to promote co-operation between the administrative, research and management officers of public and private resource agencies, to the end that a comprehensive programme be evolved for the optimum development of the natural resources and the people; to bring to the citizens of the Province, through the Conference and the printed Transactions, the facts about the resources and their actual and potential use.

The wider aims which the Conference has adopted in the course of its development are reflected in the range of topics discussed at the annual meetings. The latter consist of up to ten separate panels, each one concerned primarily with one major resource and comprising four or five experts on some aspect of the subject being considered. Papers prepared by each of these participants are read, or summar-

used to the assembly, and a general discussion follows. The published record of the annual proceedings¹ contains a large body of information concerning the specific problems of each resource, but from the view point of this article more interest attaches to indications of co-ordination and comprehensiveness. Three aspects of this are evident and may be briefly enumerated.

It was realized from the beginning that the problems of co-ordination within the Conference would be almost as great as in every-day affairs. There was a danger that the proceedings would become sharply divided into several highly technical sessions which only the interested specialists would attend. Consequently in planning the second Conference in 1949 it was decided to organise the proceedings around a central theme which would provide a common focus for the panels and papers; this practice has been followed in subsequent years. Typical themes are inventory and evaluation of the potential resources, technological advances in exploitation and utilisation, and the assessment of the significance of the Province's resources in the national and international economies. In 1959 the focussing of attention on problems of northern development provided a significant departure from previous practice and permitted a more detailed study of a distinctive sub-region.

Co-ordination is also encouraged by the reading of papers on the problems besetting the multiple use of resources. Sessions of this type bring together various special interest groups who are each trying to develop the same resource for a different purpose, and whose relationships are often so acrimonious as to prevent the achievement of anything approaching the optimum pattern of development.

The principal spheres of current controversy in British Columbia are illustrated by the following titles of papers which have been presented at one or other of the annual meetings: mining in parks and forests (1951), wildlife conservation (1952), salmon and high dams (1953), multiple use of water (1957), natural gas, petroleum and water as alternative sources of electrical energy (1957), wildlife, landowners and public access (1958). These discussions have contributed to an understanding of the problems of multiple use of resources by providing an informed and objective statement of the issues, and a balanced assessment of the alternative development policies which might be pursued. This is all that the Conference as such can do, but in enabling specialists to meet each other in an informal assembly it has undoubtedly helped towards mutual understanding. This is not to deny that the composition of the audience at the Conference sessions changes with each change of subject. On the other hand many of the delegates come to the Conference primarily to learn about developments in fields other than their own.

The specialists attending the Conference have also come together to hear occasional papers on matters of common interest. Under this heading considerable time has been given to a study of various basic factors which affect the supply of the natural resources, or facilitate their exploitation and conservation. This practice was introduced to the proceedings in the third Conference in 1950 when Mr G. S. Andrews, of the Surveys and Mapping Branch in the Provincial Department of Lands and Forests, presented a paper on the subject of base maps. Again in 1957 the whole of the opening session of the Conference was devoted to three papers on the use and value of maps. The Conference has in fact been instrumental in bringing about a considerable improvement in the range and quality of the official map-coverage of British Columbia, and in preparing and publishing a comprehensive and detailed atlas of the geography and resources of the Province².

In 1952 Dr J. D. Chapman, now Associate Professor of Geography at the University of British Columbia, contributed a paper on the climate of the province with emphasis on the relationship between climate and the quantity and quality of the various natural resources. Attention was drawn to the lack of an adequate network of recording stations, and to the way in which all organisations would benefit from more complete statistics of the variations and changes in climate throughout the Province. Since the presentation of this paper several new measuring stations have been established.

One of the basic requirements for the development of a region's resources is an efficient transportation system. Consequently the question of transportation facilities fits logically into the proceedings of a resources conference. In British Columbia the rugged terrain, sparse population and long distances raise many costly transportation problems, while the preponderance of primary industries in the provincial economy makes low-cost transportation imperative. In view of this it is

surprising that transportation did not feature in the Conference until 1958, eleven years after the first meeting. However, in that year the proceedings included a whole session devoted to transportation. This comprised four papers each of which discussed the problems and the contribution of one of the main forms of transportation, and a particularly valuable paper on the need for the co-ordination of air, sea, road and rail transport into an efficient network serving all needs at minimum cost.

A less obvious but still fundamental tool for regional development is comprehensive research covering basic characteristics and trends in the region—complementary and additional to the more specific research programmes associated with individual resources. The value of the latter was the central theme of the 1954 Conference, and the papers presented at that meeting by the various industries showed clearly the relationship between product research and commercial success. There is no similar stimulus to comprehensive regional research (as defined above), and although British Columbia is not unique in suffering from a lack in this respect the fast pace of development in the Province makes a research programme all the more necessary.

The Resources Conference has filled the gap to some extent by encouraging the regional orientation of *ad hoc* and specialist research projects, and, more directly, by inviting special speakers to address the Conference on the value of regional research and the various ways of carrying it out. For example, in 1957 Mr C. L. Hamman and Mr P. M. Dowling of the Stanford Research Institute, California, spoke about the concepts of regional development and regional development research. Previously, in 1955, a group of graduates in regional planning from the University of B.C. presented proposals to the Conference for the division of the Province into administrative, research and planning regions delimited after a comprehensive survey. So far the Government has taken little action along these lines, but the Resources Conference continues to fulfill a function in stimulating research and presenting the issues.

As its name suggests the British Columbia Natural Resources Conference is primarily concerned with physical resources such as soil, water, fish, timber, mineral deposits, power potential and wildlife. However, over the years there has been an increasing appreciation of the importance of the human resources. For people, as factors of production and the ultimate consumers are essential components in the development process, and, therefore, the quantity and quality of the region's population are topics appropriate to any regional resources conference.

From one point of view people provide the labour force without which the development of the region's physical resources would not be possible. Accordingly the Conference has heard speakers on the training of technical personnel for resource development (1956), and the factors affecting industrial relations in B.C. (1958). At the same time people as consumers have not been neglected, and in 1958 a sociologist from the University of British Columbia spoke about the aspects of the class structure and the social and psychological motivations influencing consumer decisions.

Papers have also been presented to the Conference on wider aspects of the human resources of the region. Since 1954 one half-day session at each annual meeting has been given over to a panel discussion under the title "The People of B.C.", and from 1956 this has occupied first-place on the agenda. In 1954 Dr J. Lewis Robinson, Professor of Geography at U.B.C., presented a detailed study of the trends, densities and distribution of the population of the Province, and the same panel included a study of immigration as a factor in population growth, and a paper by the Provincial Librarian on the evolution of the settlement pattern. In 1955 the medical profession contributed to the Conference with an account of the relationship of public health to natural resources and to the quality of the human resources.

In retrospect 1954 appears to mark a turning-point in the content of the Conference programme. As already stated it was in this year that the human resources were recognised as a legitimate sphere of interest. Also, from now on, more attention would be paid to the purposes which developed physical resources are intended to serve; previously the emphasis had been on the potential supply of the various resources without much consideration of the potential demand for them.

The new approach is apparent in the treatment of the human as well as the physical resources; for example, in 1954 a paper under the title "The Conservation of Human Resources", discusses, *inter alia*, the therapeutic effect of recreation, and the potential demand for recreational facilities in the Province. The next logical step was taken in 1955 with a discussion on the demand for recreation in urban areas and the various ways in which this might be catered for. Then in 1958 a paper was delivered on cultural opportunities for recreation in B.C. which considered the demand for creative leisure-time facilities and their provision. Thus over the years the people of the Province have come to be recognised as one of the more important resources in their own right, as well as for the part they play in physical development, and considerable time has been devoted to studying their requirements.

In British Columbia the continuous and active support of the Provincial Government Departments has been a key factor in the successful establishment of the Natural Resources Conference. The first two meetings were sponsored and convened by the Minister of Lands and Forests, and throughout the years Dr D. B. Turner, now the Deputy Minister of the Department of Recreation and Conservation, has occupied the post of Secretary. In 1949 the business meeting which followed the technical proceedings adopted a constitution establishing the Conference as an independent and permanent body governed by an Executive elected at each annual meeting. The members of this body are representative of each of the major resources with which the Conference is concerned. Their principal duties are arranging the next year's Conference and administering the policy agreed at the yearly business meetings.

The Conference is financed by registration fees paid by the delegates and by donations from the Provincial Government, commercial firms and labour unions. In recent years revenue from fees has been around \$2000 with donations contributing about twice this amount. The considerable secretarial work throughout the year in connection with the Conference is handled by the staff of the Department of Recreation and Conservation. Publications are normally sold at cost. These are primarily the *Transactions* and the *Atlas of Resources*, both of which are published by the Conference.

Up to 1954 the greater part of the business consisted of lengthy debates on various resolutions which individuals or groups of delegates were asking the Conference to endorse as statements of policy. On several occasions there was a sharp division of opinion over the amount of positive and direct action that the Conference should take to achieve its declared aim of implementing a comprehensive programme for resource development. This dispute came to a head in 1954 with a debate on a motion calling on the Conference to ask the Government to establish a Board of Review to advise it on proposed resource development projects. The board was to consist of five experts with no governmental affiliation and would be empowered to call witnesses and make public its reports.

The debate on this resolution divided the Conference into an "action" group, which supported the motion, and an "education" group which would rely on the publicity afforded the annual meetings to convince public and official opinion of the need for action. This was obviously a long-term policy but the Conference had no legal authority to enforce any more positive measures. Many of the delegates were wary of any attempt to put pressure on the Government, and in the course of the debate several speakers expressed the fear that passing the resolution would embarrass the many civil servants associated with the Conference and might make it impossible for them and other groups to participate in the future. This threat to the comprehensiveness and non-partisan status of the Conference would appear to be the main factor which resulted in the rejection of the motion by a large vote. The outcome of the meeting was a declaration that "action for education" should be the keynote.

Because of the disruptive effect of such disputes it was decided that, as from 1955, resolutions should no longer be in order, and none has been presented in subsequent years. However, this was not meant to preclude panellists, as individuals or committees, from calling on governmental or other bodies to take action on specific technical matters, and many such recommendations have in fact been made. This leaves the Conference, as such, an assembly diverse in views and responsibilities, uncommitted on anything other than its basic objective of promoting conservation and co-ordinated development.

Acknowledgement. The author is indebted to Dr J. D. Chapman, Associate Professor of Geography at the University of British Columbia, and a past President of the B.C. Natural Resources Conference for reviewing the draft of this paper.

- ¹ Printed Transactions of each annual Conference may be purchased (if not out of print) from The Secretary, B.C. Natural Resources Conference, c/o Department of Recreation and Conservation, Victoria, B.C., Canada.
- ² *British Columbia Atlas of Resources*, published by British Columbia Natural Resources Conference, Victoria, B.C., 1956.

THE MIGRATION OF SCOTTISH LABOUR TO CORBY NEW TOWN

D. C. D. POCOCK

In 1932 Stewarts and Lloyds announced a project for a new iron and steel works to be located in Corby, then a small Northamptonshire village. Proximity to large reserves of easily excavated Northampton ironstone, plus the erection of plant of advance design integrating the various processing stages resulted in the cheapest location and largest single production unit in Great Britain for steel-tube manufacture. Corby has accordingly grown from a village of 1,500 to a new town of 34,000, where some 10,000 are at present employed in steel-making. Almost the whole labour force has been 'imported', at first by special transfer, later by wide recruitment campaigns. Most of the initial transfer was from the firm's established plants in Lanarkshire. This, together with the subsequent success of Scottish recruitment drives, has resulted in over half of the present workers being of Scottish origin compared with less than a third from within England (Table 1). A brief study may therefore be made of the origin of the Scottish labour force,

Origin	Up to 1944		1945-1958		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Scotland	854	55	1,472	48	2,326	50.6
England	599	38	814	27	1,414	30.7
Elsewhere	111	7	767	25	878	18.7
Total	1,564	100	3,053	100	4,617	100

Table 1. Origin of workers at Stewarts and Lloyds now resident in Corby.

using the firm's employment cards as the source. The exercise provides an accurate description of a specific example of labour migration when no satisfactory census data is available. Moreover, since the number of cards examined equals 65 per cent of the town's adult males, the exercise is indicative also of the origin of population of the whole town.¹

The pattern of Scottish migration, which is clearly shown in Figure 1, is a reflection of mode of recruitment and as such requires chronological as well as spatial interpretation. The period up to 1944 under the system of direct labour transfer was one of restricted geographical origin, compared with the more widespread postwar pattern which is the result of a general advertising campaign for the whole of Scotland in conjunction with the Ministry of Labour.

Just over one half of the total has originated in one county, Lanarkshire. Since 1945 large numbers have come also from the contiguous area of Clydeside, but there has been no similar migration from the Lothians and Fife. In this respect recruitment resembles the general pattern of Scottish migration since 1931.² Within Lanarkshire the pattern is confined to the industrialised northern third of

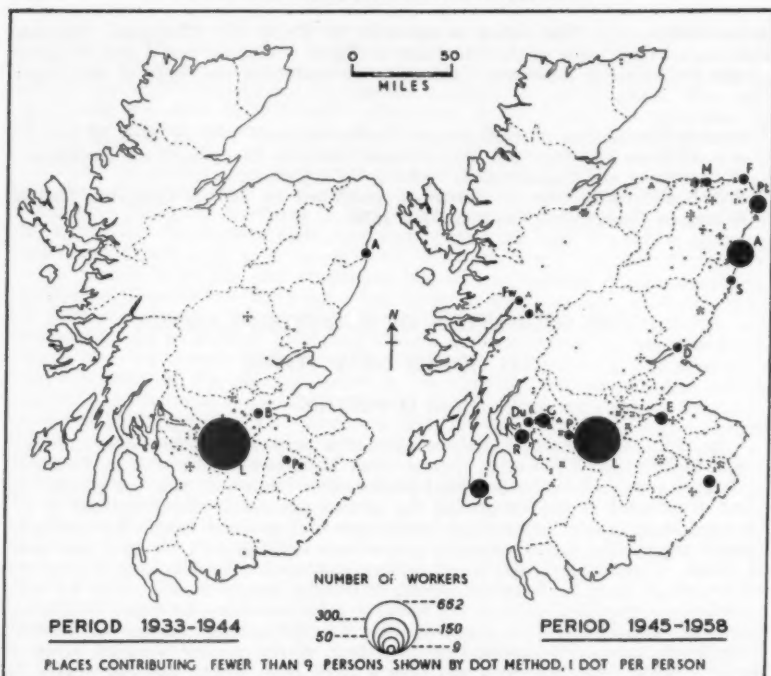


Fig. 1. Place of origin in Scotland of workers at Stewarts and Lloyds now resident in Corby. Dots are located by place of origin excepting the county total of Lanarkshire. A - Aberdeen; B - Bo'ness; C - Campbeltown; D - Dundee; Du - Dunoon; E - Edinburgh; F - Fraserburgh Fw - Fort William; G - Greenock; J - Jedburgh; K - Kinlochleven; L - Lanarkshire; M - Macduff P - Paisley; Pe - Peebles; Pt - Peterhead; R - Rothesay; S - Stonehaven.

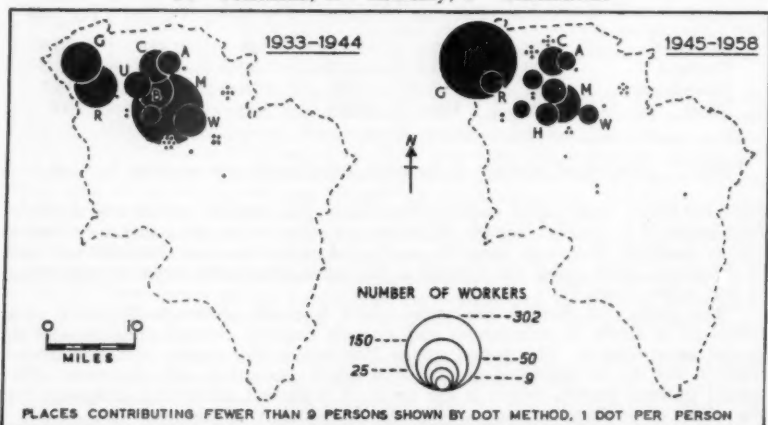


Fig. 2. Place of origin in Lanarkshire (including Glasgow) of workers at Stewarts and Lloyds now resident in Corby. A - Airdrie; B - Bellshill-Mossend; C - Coatbridge; G - Glasgow; H - Hamilton; M - Motherwell; R - Rutherglen; U - Uddingston; W - Wishaw.

the county, as is shown in the more detailed maps of Figure 2. The early period is dominated by transfer from seven steelworks situated between Glasgow, Airdrie and Wishaw, particularly from the Phoenix (Rutherglen), Clydesdale (Mossend) and Imperial (Coatbridge) works. Since 1945 the main centre of recruitment has shifted from the Motherwell area towards Glasgow. Over half of the country's postwar total has come from Glasgow, although many had stayed only a short time in the city after an earlier journey from the north-eastern counties or from Ireland. Although there has been some transfer from the Tollcross works, the majority have left a variety of manufacturing and service occupations, the latter particularly on the railway. Miners from towns such as Blantyre and Shotts, or colliery villages such as Cardowan or Kirkmuirhill have further broadened the county's postwar pattern.

The proportion of the total migration originating in Lanarkshire has been reduced from 78 to 37 per cent, mainly as a result of the rise in migration from the north-eastern counties, particularly Aberdeen. Fourteen was the sum total up to 1944, but since the war the three counties of Banff, Aberdeen and Kincardine have accounted for almost one-third of Scotland's migrants to Corby. Inland origins largely signify farmers or employees of the Forestry Commission, but the movement has been predominantly a coastal one occasioned by the decline in the fishing industry, particularly herring fishing, together with the efficacy of Corby's recruitment campaign. Over three-quarters of the total has come from more than twenty coastal towns and villages. In the smaller settlements such as Whitehills and Findochty (Banff) or Buchanhaven and Cruden Bay (Aberdeen), fishing and fish processing were often the only form of employment, but a variety of occupations is represented by migrants from the larger towns of Aberdeen, Peterhead, Stonehaven and Fraserburgh. Many had had several years' military experience, often followed by a short period at various occupations before moving on to Corby.

Migration from coastal areas was not an immediate postwar occurrence but reached its peak in the early nineteen-fifties. Between September 1954 and March 1955, for instance, 294 men arrived in Corby from seven Scottish coastal towns.³ On the western seaboard Campbeltown was the most important centre, where fishing was again the chief occupation. Other migrants from the Firth of Clyde, however, have been mainly industrial workers, many of them former dockyard or shipyard workers in Rothesay, Dunoon and Greenock.

The remaining significant contributions have come either from centres with large populations, eg. Edinburgh and Dundee, or from smaller settlements with narrow employment structures, eg. former employees of aluminium and hydro-electric plants at Fort William and Kinlochleven, or textile workers from Jedburgh. The seven crofting counties and the counties of the Southern Uplands as a whole have been little affected, but the extensive pattern of postwar migration has left only the two counties of Nairn and Wigtown completely unrepresented.

The result of the extensive recruitment described above has been the creation of a town in Northamptonshire which is markedly Scottish in character. The visitor to Corby is soon aware of street names such as Kelvin or Rutherglen, the flourishing Presbyterian church or Burns' club, the weekend bus service to Glasgow, or shop displays of Scottish newspapers and foods such as 'brides' and 'baps'. The feature most in evidence however is the widespread Scottish accent. There is at present no sign that the Scottish influence is diminishing, for half of the yearly immigrants arriving in the new town continue to be of Scottish origin. In 1959, moreover, Corby was listed along with 27 Scottish centres as a reception area for Glasgow's overspill population in a scheme to be carried out under the Housing and Town Development Act (1957)⁴. It therefore seems that Corby will continue to be known as 'Little Scotland'.

¹ A total of 5,950 cards was examined (November 1958), of which 1,333 indicated Corby addresses only. As these largely represented local persons or children of Corby inhabitants now in their first employment they have been omitted from this study of known migration.

² Osborne, R. H., *Scottish Migration Statistics: A Note*, *Scot. Geogr. Mag.*, 1956, 72 (3), pp. 153-159.

³ *Corby Leader*, 13th May 1955. Some individual totals were: Campbeltown 92, Peterhead 66, Fraserburgh 44, Greenock 40, Aberdeen 35.

⁴ Corporation of Glasgow, *Industry on the Move*, January, 1959.

PUBLIC TRANSPORT POLICY AND THE RAILWAYS OF THE U.S.A.

GERALD MANNERS

It is not only in the United Kingdom that the railways are having a difficult time meeting competition from other methods of transport, and thereby raising far-reaching questions of public policy. In the United States, too, the railways have been facing for many years declining passenger-use, and a decreasing share of the economy's freight movements. Against the background of a jungle of much-debated government regulations of various aspects of transport, the post-war years have seen the wholesale closure of branch lines, the cessation of many passenger services, and the sale of railway stations. At the same time, the Federal Power Commission has been authorising the laying of thousands of miles of new natural-gas and oil pipelines, the Federal Government has sponsored a project to build a super-highway network to criss-cross the whole country, and the Civil Aeronautics Board has supervised the steadily expanding and subsidised airways' system. What is the magnitude of the declining contribution which the railways are making towards America's transport geography? And what is the extent of the differential changes in the importance of the other transport media with the passage of time? Statistical data of various public authorities in the country give a very good idea of the size and the speed of change in the transport pattern of the U.S.A.—especially if reference is made to movement between, rather than within, cities—and it is upon these that the statistics of this note are based.

	1	2	3	4		5		6		7	Total	
	(a)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(b)	(a)	(b)
1929	154	7	20	34	455	0.1	0.003	3	106	27	198	607
1939	235	9	52	24	339	0.8	0.01	1	96	56	270	544
1949	376	28	127	36	535	9	0.2	1	139	115	450	916
1950	403	26	173	32	597	10	0.3	1	163	129	473	1,063
1951	458	27	188	35	655	13	0.4	1	182	152	535	1,178
1952	496	29	195	35	623	15	0.4	1	168	158	575	1,144
1953	529	28	217	32	614	17	0.4	1	202	170	609	1,204
1954	549	26	215	29	557	20	0.4	2	194	179	625	1,124
1955	586	26	226	29	631	23	0.5	2	217	203	664	1,278
1956	618	25	254	29	656	26	0.6	2	220	230	699	1,360
1957	645	21	245	26	627	28	0.6	2	231	223	723	1,326
1958	664	21	247	24	559	29	0.6	2	189	211	739	1,207

Table 1. Inter-city passenger and commercial freight traffic in the United States of America. 1. Cars; 2. Buses; 3. Lorries; 4. Railways; 5. Aircraft; 6. Water (canals, rivers, Great Lakes); 7. Oil pipelines; (a) passenger traffic in millions of passenger-miles; (b) commercial freight traffic in millions of ton-miles.

Sources: Interstate Commerce Commission; U.S. Corps of Engineers; Bureau of Railway Economics; Association of American Railroads; Civil Aeronautics Board.

To consider, first, changes in passenger use of the different transport media, one may go back for comparative purposes to the pre-depression years. Table 1 and Figure 1 show that in the late nineteen-twenties the railways carried some 17 per cent of all the passenger-miles travelled between cities in the U.S.A. The absolute decline in the number of passenger-miles travelled on the railways is serious enough, but the decline in the proportion carried by them has been catastrophic, dropping to a mere 3.2 per cent of the total passenger-miles in 1958. Inter-city bus services, too, have decreased in relative importance—from taking a 3.5 per cent share of the traffic in 1929 to a 2.8 per cent share in 1958—

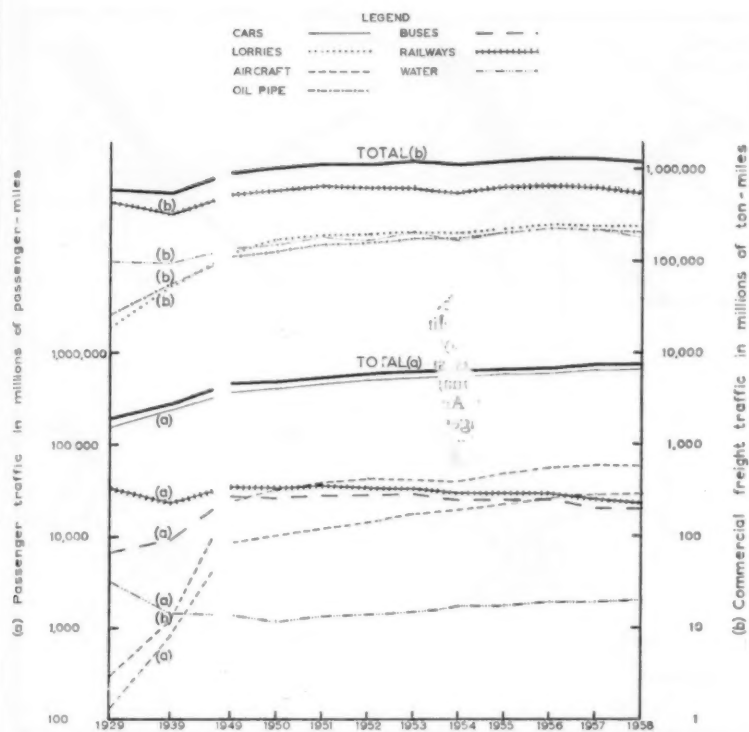


Fig. 1. Traffic in the U.S.A., 1929, 1939, 1949-58: (a) passengers in millions of passenger-miles; (b) freight in millions of ton-miles. Source: See Table 1.

although to a less extent than the railways. The airlines, (which have increased their passenger-mileage from minute proportions in 1929 to 3.9 per cent of the national total in 1958) and the private automobile, swelling its already large share of 77 per cent by a further 13 per cent, together have absorbed the losses of the railways as well as capturing the increase in total passenger movement.

Inter-city freight movement, too, has been subject to significant changes in the same period. In 1929, the railways were carrying three-quarters of all freight ton-mileage; although they increased their ton-mileage by nearly one-fifth by 1958, their proportion of the traffic had fallen to 46 per cent. Meanwhile the share carried by motor lorries had increased from 3.3 per cent to over 20 per cent, and that carried by oil pipelines from 4.4 per cent to 17.5 per cent¹. Although water traffic on rivers, canals and the Great Lakes declined slightly from 17.4 per cent to 15.7 per cent, within these figures are hidden a fall in the proportion of traffic moving by the Great Lakes of approximately one-half, and a complementary rise in the share transported along the rivers and canals from 1.4 per cent to approximately 8 per cent.

The dominance of the railways in the geography of American transport has been brought to an end, challenged first by the coming of road transport, and later by the pipeline, improved river and canal navigation, and the aeroplane. Yet this decline has coincided with a steady increase in their operating efficiency. Between 1929 and 1956 the railways increased their cars per passenger-mile and cars per freight-train by 45 per cent and 41 per cent respectively, raised their passenger and freight-locomotive miles per day by 110 per cent and 58 per cent, and improved the average net tonnage per freight-train from 804 to 1,420. Even so,

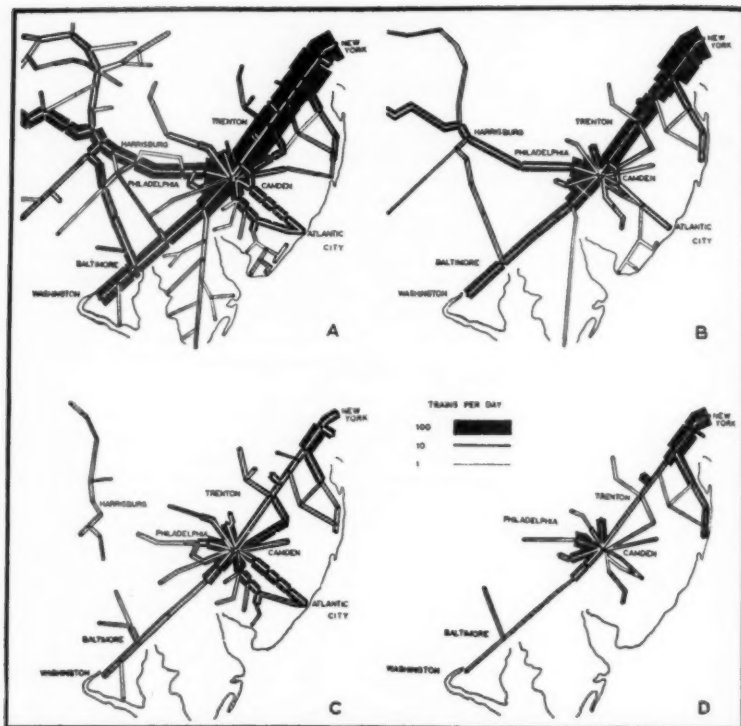


Fig. 2 Flow diagram of weekday passenger trains on part of the Pennsylvania Railroad system in 1929 and 1957. A. Total traffic 1929; B. Total traffic 1957; C. Suburban traffic 1929; D Suburban traffic 1957. Note: north en east traffic shown below and to right of the line; south and west traffic shown above and to left of the line.

the net annual incomes of the Class I railways has fluctuated between 48 million dollars and 928 million dollars, and only in three years has it exceeded the 1929 total. In terms of 1929 dollars, their income fell from 899 to 476 million dollars between the latter date and 1956.²

Reports of the Interstate Commerce Commission show that, excluding the years 1942-45, the railway passenger-services have been run at a loss since the mid-nineteen-thirties; this has resulted in a gradual reduction of their services and Figure 2 shows the typical changes in the density of the traffic flow of inter-city and suburban passenger-train services on part of the Pennsylvania Railroad system between 1929 and 1957. The loss of passenger-traffic from the railways is only partly the result of the greater convenience provided by road transport over short distances and air travel over longer distances. Equally important are the hamstringing effects of legislation and archaic regulatory procedures which belong to the days of railway monopoly when the public needed protection and not to the competitive situation of transport in the mid-twentieth century.³ Rate adjustments and the withdrawal of passenger services, for example, must be approved by either a State Commission, or the Interstate Commerce Commission; this approval frequently involves not only time but also considerable litigation expenses. Furthermore, the railways justifiably complain about the obligation to carry U.S. Mails on their passenger services at uneconomic rates, and also about the high taxes which are imposed upon their installations (such as stations, tunnels

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and bridges) whilst the airports and water terminals of their competitors are frequently subsidised from the public purse.

These disadvantages also affect the railway freight-services which have to make good the losses incurred upon the passenger services. Further, the freight services have had to meet particularly strong competition from the road transport of agricultural produce which is not subject to economic regulation. The road hauliers are not obliged to publish rates, which has made the railways particularly vulnerable to this competition. For example, much of the transport of citrus fruits and vegetables from Florida has changed over from rail to road since 1945 (Table 2).

	Citrus Fruits		Vegetables	
	per cent		per cent	
	by rail	by road	by rail	by road
1945/46	91.2	8.8	76.6	23.4
1950/51	59.1	40.9	48.1	51.9
1956/57	34.6	65.4	30.7	69.3

Table 2. Transport of Citrus Fruits and Vegetables from Florida.

It is apparent that certain biases in public transport policy have evolved at both local and national levels which were not adopted deliberately, but which today considerably hamper the ability of railways to meet competition from alternative forms of transport. Only the pipeline has expanded its rôle in the transport patterns of the U.S.A. without public subsidy.

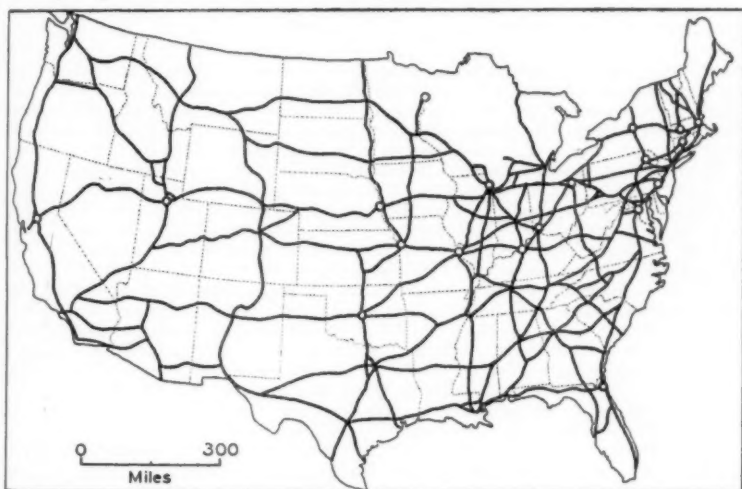


Fig. 3. Highways of the U.S.A. The high-speed, limited-access, multi-lane and toll-free system planned for 1969.

When one considers some of the intrinsic economies of other means of transport, it becomes obvious that the railways could not hope to maintain the percentage of traffic which was automatically theirs in the early years of this century. It was inevitable that they should give up part of their traditional rôle, losing their traffic in certain commodities and over certain distances. However, it does seem that the lack of a well-reasoned Government transport-policy has

reduced and continues to reduce the rôle of the railways in the economy to less than their useful potential. The urgent need for Government action in these matters has been underlined by the Federal-aid highway programme of 1956. At the moment there are less than 3,000 miles of high-speed, limited-access, multi-lane toll highways in the U.S.A., but the 1956 programme plans to absorb these into a 41,000 mile toll-free system serving the whole of the country by 1969 (Figure 3). These highways are mass-transport facilities, in direct competition with the railways, many of which they parallel on the ground, for along them huge diesel lorries are able to carry bulk loads at speeds of 55 to 65 mph. Regardless of any change in public policy these highways will enhance considerably the inherent advantages of road transport, and attract yet more traffic away from the railways.

¹ These figures underestimate significantly the contribution made by the pipeline to transport in the U.S., for they neglect the transport of natural gas and water.

² *Problems of the Railroads*. Hearings before the Sub-committee on Interstate and Foreign Commerce, Eighty-fifth Congress, January, 1958; Part. 1, Testimony of Dr Margaret Davies, formerly Lecturer in Geography at Manchester University of the Railroads, Washington, 1958, p. 51.

³ *Problems of the Railroads*, *Op. cit.* p. 74 ff.

GEOGRAPHY AT THE BRITISH ASSOCIATION

1960

Cardiff, now the capital of Wales, played host to the British Association for the Advancement of Science for its 122nd Annual Meeting from Wednesday 31st August to Wednesday 7th September, a privilege it last enjoyed in 1920. Since there is no Department of Geography in the University College of South Wales and Monmouthshire, Section E was particularly fortunate in securing the services of Dr Margaret Davies, formerly Lecturer in Geography at Manchester University and now a resident of Cardiff, as its Local Secretary. Section E itself was housed in the University College though both the Presidential Address by Professor E. G. Bowen (*Aberystwyth*), attended by well over 260 people, and the Lister Lecture by Mr W. M. Williams (*N. Staffs*) were given in the Reardon Smith Lecture Theatre attached to the National Museum of Wales.

The Presidential Address dealt with "Welsh Emigration Overseas", a geographical subject well suited to a meeting of the Association in Wales. Professor Bowen made it clear that Welsh people have distinguished themselves as colonists in many different lands and would appear to show a facility for adapting themselves, often under very difficult circumstances, to new environmental conditions both physical and cultural. The Lister Lecture on "The Social Study of Family Farming" which followed examined family farming as an expression of an enduring relationship between society and "the land".

The Section E programme for the first morning was, by tradition, devoted to papers of local interest; Dr Margaret Davies gave an illustrated survey of the differing landscapes of the area between the Wye and Bridgend and the Bristol Channel and Brecon; Professor S. H. Beaver (*N. Staffs*) studied transport and industry in eastern South Wales, 1750-1950; and Messrs H. W. E. Davies and D. F. Hagger spoke on recent industrial changes in South Wales. These papers were followed in the afternoon by excursions through Cardiff Docks (Dr Margaret Davies) and the Vale of Glamorgan (Professor E. G. Bowen and Mr H. Carter, *Aberystwyth*).

The first part of the lecture programme was completed on the Friday afternoon by a joint session with Section H (Anthropology) on "Leadership in Rural Societies". The subject was introduced by Lord Rennell of Rodd; J. B. Caird (*Glasgow*) and H. A. Molesley (*Glasgow*) spoke on "Leadership and Innovation in

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Crofting Communities of the Outer Hebrides"; Miss R. L. Harris (*Belfast*) discussed "Leadership in a Border Community in Northern Ireland"; M. Kirk (*Leeds*) considered "The Suburban Community in the Countryside" and D. Jenkins (*Aberystwyth*) presented a study of social change in south Cardiganshire in the years within living memory. Professor Bowen opened the discussion which, because of the nature of the subject, failed to interest the geographers present.

Field excursions occupied the weekend period and their rich variety afforded significant pointers to the advantages of Cardiff for a meeting of this kind. On the Saturday, parties visited the lower Wye Basin (Professor A. Austin Miller, *Reading*), made a transect of the eastern Coalfield and the Brecon Beacons (Miss G. E. Groom, *Swansea*) and visited the Swansea region (G. Manners, *Swansea*). Sunday's excursions covered Gower (Dr S. H. Cousens, *Swansea*), The Forest of Dean (F. T. Baber, *Cardiff*) and the Taff-Cynon-Rhondda section of the South Wales Coalfield (Dr G. Melvyn Howe, *Aberystwyth*).

Monday was devoted to the "World Food and Population Symposium" to which Professor L. Dudley Stamp (*London*) contributed a paper "Land Use and Food Production". In the afternoon there was a field excursion devoted to the geomorphology of the southern Coalfield border ridges (J. R. Cooper, *Cardiff*).

The Section E dinner, held by tradition on the Monday evening, was well-attended. It was arranged most successfully in the Royal Hotel, in the room where Capt. Scott had dined previous to his sailing from Cardiff to Antarctica to reach the South Pole and to die on the return journey. The guests included Mr F. Blaise Gillie of the Ministry of Housing and Local Government and Professor D. K. Dziewonski of Poland, who was the foreign guest of the Section at the Cardiff meeting.

The lecture session on Tuesday morning was devoted to geomorphology: Professor D. L. Linton (*Birmingham*) spoke on "Some Scenic Contrasts in the Antarctic Dependencies of the Falkland Islands"; Mr E. Derbyshire (*N. Staffs*) considered the degree of ice inundation in upland England and Wales during the last glacial period; and E. M. Driscoll gave a paper on glacial drainage in the Vale of Glamorgan. In the afternoon the programme of excursions was completed with an interesting examination of the railway geography of South-East Wales (Professor S. H. Beaver, *N. Staffs*), and the physical and economic geography of the eastern bituminous section of the Coalfield (Dr G. Melvyn Howe) with particular reference to the Clydach Gorge and Mynydd Llangattwg (Mr Percy Jones, *Nantyglo*).

The meeting ended on the Wednesday morning with four papers. Dr G. Melvyn Howe discussed "The Geographical Variations of Disease Mortality in England and Wales in the Mid-20th Century"; Mr G. R. J. Jones (*Leeds*) examined "The Celtic Basis of Settlement Patterns in Anglo-Saxon England"; Dr P. D. Wood (*Reading*) discussed "Frontier Relics in the Urban Morphology of the Welsh Borderland" and Mr H. Carter presented "A Scheme for the Analysis of Welsh Townscapes".

G. Melvyn Howe.

INTERNATIONAL GEOGRAPHICAL UNION

XIX CONGRESS 'NORDEN' 1960

The most important geographical meeting held in Europe since the war took place in the five Scandinavian countries of Denmark, Finland, Iceland and Sweden in July and August this year. This 19th International Geographical Congress took the now accepted form of a Congress Meeting, held in Stockholm, and Symposia and Excursions held in various centres throughout 'Norden'.

The Congress sessions in Stockholm were held under the auspices of King Gustaf VI Adolf of Sweden and took place between August 6th and 13th. During this time more than 350 papers were read before the nine Sections and fifteen Commissions into which the Union is divided, while exhibitions of *National Atlases and Thematic Maps, Population Maps, Cadastral Plans and Old Maps, Modern Swedish Maps, and International Geographical Literature*, were open concurrently. Other exhibitions were on view in the Swedish Krigsarkiv and in the Stockholm City Planning Department. The Congress was opened by Governor Rickard Sandler, President of the Swedish National Committee of Geography, and delegates were further made welcome to 'Norden' and the meetings by the President, I.G.U., Professor Hans W:son Ahlmann. Later in the day, Professor William William-Olsson, of Stockholm School of Economics, provided an introductory address on "Stockholm, structure and development" which was received most appreciatively by the visitors to the city. This, together with Professor William-Olsson's book on Stockholm, formed a splendid introduction to the host city.

There followed a week of concentrated activity for the 1,500 delegates from nearly 60 countries. Each Section was hearing five papers daily and these were not infrequently crammed into forenoon or afternoon sessions to enable members to attend perhaps a related Commission meeting held on the same day. The result was that, even with judicious 'plugging' of items on the daily calendar of events, the scope of the Congress was, even for geographers, too wide. Many members agreed that the number of papers should have been cut down. This feeling was not only induced because of the quantity of material being dispensed but also, unfortunately, sometimes because of the quality of some papers. On occasion one felt that academic morality was from time to time being sacrificed on the altar of patriotic enthusiasm or international diplomacy.

Each country, on the other hand, was provided with a chance to bring its geographical 'products' to the notice of the others and nowhere was this more evident than in the exhibitions. More time should have been available for the study of these various displays. It was a matter of regret, for instance, that these should have been closed to members in the evening. The value of much of the material on display was reduced by frequently poorly staged exhibits. This was especially true of the exhibition of population maps in the School of Economics. On the other hand the exhibits on display at the *Krigsarkiv* were admirably shown and it was a pity that so few geographers visited this exhibition.

Although both official parts of the programme had their shortcomings, it must not be thought that the Congress meetings failed to achieve their ends. On recollection, however, perhaps the most valuable aspect of these meetings was the opportunity open to all members to meet other geographers from the four corners of the globe. Personal contacts made will go further to making geography truly a world-wide subject than much formal training. An interesting aspect of many of these personal meetings was the frequent reference made to our Society and its periodical.

Of lasting value also will be the publications of this Congress. These can seldom have attained such a high standard before and they serve as an indication of the enthusiasm and dedication of the relatively small band of geographers in Scandinavia. The most striking of the publications issued at the Congress must be *Norden*, the excellent text on the host countries edited by Professor Axel Sømme of Bergen. This work, and the splendidly produced guides to the five countries all reveal long months of patient preparation and co-operation by the northern geographers.

This co-operation, so successfully seen in the 'Norden' Congress, can rarely have been equalled in I.G.U. meetings. Never before has a Congress been spread over a group of countries and seldom before has a Congress been so successful. Perhaps it will be that other groups, such as Benelux, or the Alpine countries, will be hosts to the Union in future years, so that geographers might meet in a geographical setting rather than a purely political one. Before such events take place however British geographers will have the privilege of being hosts to the I.G.U. in London in 1964. Two new Commissions will, by then, have joined the fifteen previous ones as it was decided to form one on Cartography, under the Chairmanship of Professor Imhof (Switzerland) and another on Methods of Economic Geography Regionalisation, with Professor Leszczynski (Poland) Chairman at the meeting in Stockholm.

Ian A. G. Kinniburgh

EXPANSION AND RETREAT OF RURAL SETTLEMENT

As mentioned at the head of this report, the Congress was divided between the Stockholm meetings and symposia held in various parts of Scandinavia. In order to make this review more comprehensive, comments are provided on two of these symposia one of which was held before the Stockholm meetings and the other held afterwards. These field symposia are steadily gaining a place of supreme importance in the life of I.G.U. and their value cannot be too much emphasised. The group meetings of the symposia lasted several days and included short excursions in the field led by local experts they were, in every respect, more profitable than the over-concentrated, overlapping and overcrowded paper sessions in Stockholm.

In the Siljan symposium, held at Brunnsvik and Rättvik prior to the Congress, Professor Gerd Enequist and Dr Gösta Eriksson of Uppsala led a series of paper sessions and discussions on the theme of "Expansion and Retreat of Rural Settlement". These took place in the course of a week's excursion through 500 miles of forest, farming and mining country on the southern fringe of Norrland, Sweden. By this arrangement and with the expert guidance of Professor Enequist's staff and the wealth of documentation in research papers, maps and exhibitions, an unrivalled insight was given into the process of expansion of rural settlement since the sixteenth century and the subsequent retreat accompanied by urbanisation, notably in the Bergslagen timber and iron-working region and the farming and tourist country of Dalarna around Lake Siljan. The visits made ranged from one to a seventeenth-century Finn settlement and a recently abandoned seter, to industrial museums and modern iron-mines; a notable feature was the hospitality—and the abundance of illustrated literature—provided by industrial firms with a long history of resource development, now often extending over whole river basins.

Papers were given which dealt with the current problems of agricultural depopulation and settlement-planning in northern Sweden and with such general questions as changes in the limit of inhabited territory (the *oecumene*) and the definition of this limit, the impact of industrialisation and the development and planning of urban service-centres. Comparative studies of other countries included papers on U.S.A. (New England), Canada, West Germany and Scotland. The concluding discussion led by Professor Kirk Stone, of the University of Wisconsin, raised rather more questions on these topics than it answered! Some disagreement as to whether or not settlement geography should be concerned largely with applications to planning was, in effect, resolved by the manifest 'purity' of the Swedish geographers' contributions to planning and by the fact that their services are so fully made use of by Government agencies.

Frank D. N. Spaven

PROBLEMS IN URBAN GEOGRAPHY

This post-conference symposium provided unequivocal evidence of the recent, rapid growth in scope and stature of this specialism of geographers. Over 70 persons attended the symposium and 32 papers, which ranged widely over the subject matter, were presented. For the serious enthusiast it is true to say that the five days in Lund constituted an experience so worthwhile that it would have been a tragedy to have missed it.

The outstanding trend, dominating the contributions was the intense interest shown in methodology. Although many new and useful techniques for urban analysis were illustrated and discussed, the most profitable result of the symposium was the progress made towards the development of an organised body of knowledge. Urban geography has become mature and is facing the task of systematising the results of the detailed work which has accumulated during the last forty years. Stepping up, as one author puts it, "the process of sifting out and rejecting weak ideas and vigorously searching for thoughts, with more cutting power". This intense concern for methodology in the formulation of principles was the dominant theme and unifying thread through all the papers and discussions.

As was to be expected in an international gathering certain national traits were evident in the methods and techniques employed in this rigorous process of testing hypotheses and stating valid generalisations. The North Americans are embarked on a thorough statistical treatment of enormous quantities of material; this is particularly true of economic data such as is available on transport, employment, and land values. In contrast was the British approach utilising mostly historical and social data in an almost entirely non-statistical manner. The German geographers, who were well-represented and seemed to have re-established their tradition of careful methodological analysis, contrasted sharply with a solitary Frenchman concerned more with the practical difficulties of technique.

The symposium was delighted to have as its first paper one entitled "Die Hierarchie der Städte", by Dr Walter Christaller. It was more than fortunate that many succeeding authors were able to pay their intellectual debts to this man personally, and in the form of their own very real contributions. Since its enunciation in 1933 the Central Place Theory has been a vital theme in urban geography and this symposium again revealed its extraordinary potential, and hence the debt of urban geographical studies to Dr Christaller. Contributions on the Central Place theme included "American Studies of the Central Place Hierarchy", "Simulation of Central Place Patterns over Time", "The Stability of Distance—Population Size Relationships for Iowa Towns from 1900-1950", "Central Places in an Agricultural Region", "Analysis of Central Place and Point Patterns by a Nearest Neighbour Method", "Die zentralen Orte und ihre Einflussbereiche", "English Central Villages", and "The Hierarchy of Central Functions within the City".

Closely allied and inter-related to this theme were the studies of city function especially those concerned with retailing locations. These included "Service Centres within Towns—Elements of an Operational Approach", "Emerging Patterns of Commercial Structure in American Cities", "Die City als Stadtteil", "Conformations of Service and Retail Activities in the Punjab", "The Structure of Retail Trade in a Small Swedish Town", "The Central Business District of Glasgow", "Zur Frage der inneren Gliederung der Stadt", "Trends in Central-Area Differentiation", "Central Business District Research". The contributions on a broader functional approach promoted several new ideas. "The Minimum Requirements Approach to the Urban Economic Base" appears to have overcome many of the practical difficulties besetting the functional classification of towns, and similarly "Factors Influencing the Location of Highway-oriented Retail and Service Activities", "Des Zones d'Influence des Grandes Villes Françaises", "Commercial Application of Urban Hinterland", "The Geography of Banking in Sweden", "Zum Problem der quantitativen Erfassung Städtischer Funktionen", all contained useful and provocative ideas from which the subject will benefit in the next decade. One paper presented dealt with the research possibilities of the decade beginning in 1970. "Toward a Simulation Model of Urban Growth and Development" pointed out that "computer simulation has proved a valuable problem-solving technique as well as an aid to the study of many operating systems", including urban systems. The author hopes that "by 1970 technical changes in the computer industry and new findings will make research with integrated models possible".

The symposium did not ignore the qualitative aspects of urban studies and it was an American who pointed out that the predictability of Newtonian mechanics and Darwinian evolutionary concepts could be very misleading, for the human element was often highly unpredictable. A population projection for Detroit, made in 1900, would be a good example. However, the papers presented on the social aspects of urban analysis again revealed a search for a systematic framework and

useful generalisations. "Urban Expansion and Social Integration", "Segregation in Urban Residential Districts", "Soziale Anlagen, einer mobilen gesellschaft Überlegungen zur ökologischen Gross-stadtforschung" and "Centre Shifting and Centre Mobility in Japanese Cities" were all examples of the interest of the urban geographer in the difficult study of the social influences.

The trend away from morphological studies was confirmed by the fact that only one paper was strictly in this field—"The Plan Analysis of an English City Centre". This was concerned with developing a systematic framework for townscape analysis which was evolutionary and genetic in type, as is required in Europe, with its long history of urban development. "Urbanisation in Brazil", "Entwicklung und Probleme der Italienischer Gross-Städte" were useful contributions also using the historical and evolutionary approach.

With so varied a series of contributions it is perhaps useful to ask, what was not represented? The answer seems to be twofold. First the study, for example, of the site, situation or population distribution of a particular city, from which it is difficult to gain any understanding of the wider principles involved. Second, and more surprising, was the tendency to ignore the practical applications of the new theories and principles. It may be true that an academic meeting of this kind is not the place for such discussion, or that much of the new material is as yet not sufficiently digested to be able to be used for the guidance of urban planners and the like. This certainly is one aspect of the subject which should be given greater prominence in 1964.

Such an academic feast can of course only take place if the table is laid with care and the host well prepared. On this score Professor Torsten Hagerstrand and his colleagues cannot be too highly praised or sufficiently thanked by the participants. As memorable as any paper was the delightful social evening at Östrap and the valuable excursion to the City and University of Copenhagen. While it is true that the local environment was extraordinarily suitable for such a gathering it seemed quite clear to all who attended the symposium, that the moral to be learned was that small specialised groups should become a permanent feature of the I.G.U. programme. It is hoped that those responsible for 1964 will be able to match the supreme performance of our Swedish hosts.

All the papers and a summary of the discussions are to be published in book form by the University of Lund in 1961.

Derek Diamond

SECOND INTERNATIONAL CARTOGRAPHY COURSE

1960

A most successful practical cartography course for professional cartographers was organised and directed by Professor Ed. Imhof, President of the International Cartographic Association and Director of the Cartographic Institute at the Swiss Federal Institute of Technology in Zürich, in collaboration with Mr E. Huber, Director of the Federal Topographical Survey in Bern.

This year's course was attended by 27 participants from 12 countries. Six weeks were spent in Zürich studying basic principles of cartographic representation, including compilation and generalisation, with special emphasis on Swiss methods of showing relief by hill-shading. In Bern, two week's instruction were given on techniques of map printing and organisation. Visits were made to commercial houses in both cities, as well as to the precision instrument firms of Kern in Aarau, and Wild in Heerbrug.

ON THE NATURE OF GEOGRAPHY

A REVIEW

JOHN H. PATERSON

It is twenty-one years since the publication of Professor Hartshorne's *The Nature of Geography*. The book, whose appearance went unnoticed in the Society's magazine, has established itself in the interval as the undisputed reference authority on the subject, hard to read but impossible to disregard. It is difficult now to imagine, for example, how courses in Geographical Thought were given in American universities before it appeared. Among British geographers, however, it has not achieved quite the same degree of sanctity, and has been honoured more in the bibliographies than in the critical discussion of British writers. It is admittedly not easy reading, and even if it were there exists in this country a strong body of opinion which holds that talking about the nature of geography is, in any case, generally a substitute for doing any.

But now Professor Hartshorne has followed his first volume with a second, *Perspective on the Nature of Geography*.¹ It is much easier reading than its predecessor. Whether it will convince the doubters that methodological study is not merely respectable but actually necessary remains to be seen. *Perspective* represents a welcome move by Hartshorne to bring *The Nature of Geography* up-to-date. This he has done in part by reviewing the literature of the past two decades, in part by modifying his earlier conclusions, and in part by some down-to-earth clarification of arguments which friend and critic alike have found obscure. The original work was admittedly something of a Topsy, and in any case dealt at length with several topics — such as that of 'Landscape' — now seen as meriting less attention than Hartshorne gave them, whereas others — particularly the rôle of the time-element in geography — proved to be lively issues requiring more extended treatment.

The present volume puts much of this right. There is a welcome explanation of the original conclusion that geography is the study of "areal differentiation", an assignment so uninviting as to move one geographer to comment that, while he conceded that Hartshorne had defined the field of geography, he no longer wanted to study it. Then there is a staunch defence against those geographers who insist that before considering the geography of an area, it is necessary to have traced the history of its development from the earliest times to the present day. There is a much fuller discussion of the position of geomorphology than there was in the first book. And there is a renewed plea for geographical broad-mindedness as between the systematic and the regional, the physical and the human aspects of the subject. This latter division, accepted as sacrosanct and built into the structure of many a university's Faculties, Hartshorne shows to be in reality a relatively recent conception, wholly disruptive in its effect.

All this undoubtedly demands attention. For the British geographer, however, perhaps the most interesting features of *Perspective* are the bibliography and index, in which he can assess his own country's contribution to the discussions of the past twenty years. He finds that the British work cited by Hartshorne consists for the most part either of inaugural lectures or of arguments about determinism.

As for the first of these groups it is, of course, entirely proper that the newly-appointed professor should, on inauguration, offer a preview of his aims and methods. But the fact that it is, usually, only on such special occasions that methodology is discussed tends to segregate such discussion from geographical work in general, and to reduce it to a series of more or less *ex cathedra* statements. a position which Hartshorne has already specifically deplored.²

British preoccupation with determinism during this period is a rather curious phenomenon. The deterministic concept in geography has been out of favour for so long, and has been the object of so many frontal attacks, that its survival in any form may seem surprising. Lest, however, the reviewer should give the impression that British geographers are hopelessly behind the times in all this, it must at once be explained that this is a revival of interest in the idea of determinism rather than the acceptance of deterministic ideas *per se*. Since the days of Semple and *Influences of Geographical Environment* (1911) the nature of the argument has altered. An argument about the effect of upland climate or Appalachian valley

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routes on specific human groups has been replaced by an argument as to whether it is permissible to say that Cause *a* determines Effect *b*.² Thus the body of the argument has been left for dead; it is the soul that goes marching on.³

A further impression created by the bibliography of *Perspective* is that, as already noted, there has been little attempt in Britain to discuss the major findings of *The Nature of Geography*. The work of British geographers made major contributions to a few sections of that book, particularly the chapter on historical geography, and such important recent papers in this field as those of Darby⁴ and Kirk⁵ are duly noted in *Perspective*. But the British reader must be aware, as he studies the new volume, of the extent to which discussion of the general principles enunciated by Hartshorne has been left to Professor Wooldridge.⁶ Indeed, the lengthy discussion of the place of geomorphology in relation to geography in *Perspective* might be regarded as a tribute, albeit indirect, to Professor Wooldridge's dominance in this field of general methodology. But it is surely time that others of us undertook to share the burden.

Perspective, like its predecessor, will probably sell in the first instance to students following courses in the history of geographical thought. It may, therefore, be appropriate to conclude these remarks with a comment on the use of these books for teaching purposes. Throughout both of them, Hartshorne emphasises that he has defined geography by analysing what geographers do, and has been concerned only to discover whether their activities have a logical basis. Without lessening appreciation of the author's great work, it may perhaps be suggested that, for the teacher, this approach is not the most useful one. This comment has been made before, and Hartshorne answered it by the suggestion that it should be good training for competent students "to have them 'wade through' some of the argumentation of their predecessors, involved and obscure as that may be."⁷ But is there no alternative to such desperate heroism, no road through the jungle?

While specific problems of considerable complexity admittedly exist, experience in teaching courses on 'geographical thought' suggests that it is quite possible to produce a simple and manageable outline for teaching purposes, into which most topics for discussion can be fitted. If we can begin by establishing that the phenomena comprising reality can be studied according to their distribution by category, space or time,⁸ and that geographers are concerned with distributions in space, we can then ask the reasonable question. "To study geography, what else do we need to know?"

The practice of geography will be difficult, if not impossible, unless we know at least: What is the purpose of our studies?—What are we trying to discover? What are the objects or units of study? In what way can the One World best be divided for detailed study? What relations exist with those who study by category or by time — i.e. the systematic scientists and the historians? Given such an outline, and the materials assembled by Hartshorne, it has proved in practice easier to organise a study of this subject than it is either by using his own outline or by following the familiar historical approach that begins with the Greeks and proceeds via Varenius. Areal differentiation, determinism, systematic *versus* regional—all are there, but some parts of the old arguments can now be discarded, precisely as Hartshorne appeals that they should be, for they represent misconceptions of the nature of the subject.

It may, indeed, be that the most useful service performed for British geographers by this new and welcome volume of Hartshorne's is to distinguish between methodological problems that are unavoidable, because they are inherent in our field, and problems that have arisen unnecessarily from previous — often personal — aberrations. There is no question of carrying on an argument for its own sake and if we can, in the future, discard the second group of problems and concentrate on the first, we may yet win agreement that the nature of geography is not merely a topic for after-dinner discussion, when the serious work of the day is done, but an integral and essential part of our field.

¹ *Perspective on the Nature of Geography*, By Richard Hartshorne. 87/8 × 56/8. Pp. VIII + 201. Chicago: Rand McNally, for the Association of American Geographers. 1959; London: John Murray, 1960, 30s.

² See, for example, Martin, A. F. *The Necessity for Determinism: A Meta-*

physical Problem Confronting Geographers, *Trans. Inst. Brit. Geogr.*, 1951, 17: 1-12; Montefiore, A. C. and Williams, W. M., Determinism and Possibilism, *Geogr. Studies*, 1955, 2: 1-11; Jones, E., Cause and Effect in Human Geography, *Ann. Ass. Amer. Geogr.*, 1956, XLVI: 369-77.

³ But on this point see Spate, O. H. K., Determinism — The End of an Old Song?, *Geogr. Rev.*, 1958, 48: 280-282.

⁴ Darby, H. C., On the Relations of Geography and History, *Trans. Inst. Brit. Geogr.*, 1953, 19: 1-11.

⁵ Kirk, W., Historical Geography and the Behavioural Environment, *Indian Geogr. Soc.*, Silver Jubilee Souvenir, 1952, 152-60.

⁶ Mainly in Wooldridge, S. W. and East, W. G., *The Spirit and Purpose of Geography*, London, 1951, and Wooldridge, S. W., *The Geographer as Scientist*, London, 1956.

⁷ Hartshorne, R., *The Nature of Geography*, *Ann. Ass. Amer. Geogr.*, 1939. The quotation is from the "Preface to the Third Imprint", 1948.

⁸ Perhaps with the aid of Hartshorne's own paper, The Concept of Geography as a Science of Space, From Kant and Humboldt to Hettner, *Ann. Ass. Amer. Geogr.*, 1958, XLVIII: 97-108.

REVIEWS OF BOOKS

CARTOGRAPHY AND SURVEYING

Landscape Drawing. By G. E. Hutchings. 5 $\frac{3}{4}$ × 9. Pp. IX + 134. 100 figs and sketches. London: Methuen & Co, 1960. 30s.

Probably the most neglected aspect of geographical teaching is field drawing. In very few schools, colleges or universities is it included in sufficient detail in the curriculum. In many it is not taught at all! Nevertheless the only way to acquire a true 'eye for country' is to become conversant with, and if possible skilful in, the art of landscape drawing. The reason for ignorance of the techniques involved is partly due to the increased use of the camera in field work but also because of the fact that very few adequate texts exist to encourage the student, or the teacher, to overcome his fear of drawing.

Mr Hutchings has produced a very fine book which will be suitable for students, teachers and pupils alike. He teaches by example and his models are well chosen from the works of Ruskin, Lear, Geikie and Linton for instance.

The book does however have certain disadvantages. Designed apparently for the beginner, it might have been expected that the book would have provided more explanation of the materials and techniques involved in drawing. The author also adopts a slightly brusque attitude in his text which, while suitable for the converted pupil, might not, perhaps, induce those new to the subject to lay down their cameras and take up pen or pencil. Indeed the author appears to be beset with the feeling that he must crusade against the camera. The standard of the examples used in his book should surely quell any doubts which the author may have regarding the efficiency of drawing in the film era.

The author must be complemented on this book which propounds the almost scientific principles of landscape drawing very skilfully. To look through the examples is an exercise in itself and it is to be hoped that the book will find its way to the libraries of schools and universities and to the pockets of field workers for, as Mr Hutchings says, "drawing is a recognised auxiliary to all branches of knowledge founded on visual observation".

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An Outline of Photogrammetry. By K. Schwedfsky, translated by J. Fosberry. 9×6. Pp.326. Numerous diagrams and photographs. London: Sir Isaac Pitman and Sons, Ltd., 1959. 60s.

The most striking change in the art of surveying in recent years has been the scrapping of the traditional methods of ground survey and the very rapid and widespread adoption in their place of methods utilising aerial photographs. This change over—a revolutionary one—has been made much later in Britain than in Continental Europe, especially with regard to the use of stereoscopic plotting machines. One of the factors in this late development in this country has been the lack of a textbook in English which dealt with and could make known advanced photogrammetric techniques. With the appearance of this translation of Professor Schwedfsky's German book *Grundriss der Photogrammetrie* this gap in the literature has now been bridged in the most authoritative manner.

Starting with a brief historical sketch of photogrammetry, the reader is given a comprehensive and lucid account of the fundamentals of the subject, including the geometry of the photograph, the relevant aspects of optics, stereoscopic vision, and photographic materials and techniques, passing on to a discussion of terrestrial photogrammetric methods and the instruments and procedures used in aerial photography. This complete introduction occupies nearly half the book, but it is in no way overdone and forms an indispensable preparation for the remainder devoted to the techniques and instruments, both simple and complex, used to make maps from aerial photographs.

In this second part of the book the only serious criticism, and one which will be more readily made by a British photogrammetrist than by others, is the inadequate treatment of analytical aerial-triangulation, a technique for providing control points pioneered and developed by the Ordnance Survey who are applying it extensively in the current re-survey of the Scottish Highlands and one which other organisations abroad are now beginning to adopt. This is a surprising deficiency in view of Professor Schwedfsky's known interest in analytical methods as evinced by his important article "New Aids for Numerical Photogrammetry" which appeared in 1958. The many other plotting and triangulation methods are however very adequately treated and there is a most stimulating discussion in the last chapter of the many possible future applications of photogrammetry in non-topographic fields.

Already a standard work in several other languages, this well-produced book is assured of a similar status and success with professional map-makers in the English-speaking world.

G.P.

MAPS AND ATLASES

Atlas Nationaux: Histoire, Analyse, Voies de Perfectionnement et d'Unification. By K. A. Salichtchev. 8 × 5. Pp. 150. 9 tables. 4 diagrams. 3 maps. Moscow: Ed. Acad. Sci. de l'URSS, 1960. 6rb. 50k.

Among the innovations introduced for the XIXth International Geographical Congress held at Stockholm in 1960 was the publication in advance in the *IGU Newsletter* of summary reports of the work of the Commissions appointed or re-appointed at Rio in 1956. Previously the Reports of Commissions had been issued as separate publications, often difficult to trace or obtain after the Congress. The new arrangement, however, has meant that only very brief summaries could be printed, and some Commissions have therefore published fuller reports elsewhere. The Commission on National Atlases under the Chairmanship of Professor K. A. Salichtchev, has gone much further. It held a plenary session at Moscow and Leningrad in August, 1958, and that conference judged it necessary to prepare and publish "in compact form a systematic and analytic review of national atlases already existing or in preparation, together with certain recommendations relative to their establishment". This is precisely what the present report does: it is a very convenient summary of the contents of the National Atlases of Finland, Russia, Egypt, Czechoslovakia, Italy, Tanganyika,

India, Canada, Belgian Congo, Australia, Sweden, France, United States, Morocco, Poland and Israel.

This analysis is used as a basis for detailed comments and criticisms and recommendations regarding subjects which should be treated in a national atlas, and such matters as projections and format. In view of the many countries, including Scotland, which have such projects in hand, the report is both opportune and useful. It may with advantage be read in conjunction with the Polish contribution to the Commission, *National Atlases: Sources, Bibliography, Articles*, Polska Akademia Nauk; Inst. Geografii; Documentacja Geog. Nr 4, 1960. L.D.S.

Géorama — France. 13 × 10. A series of 6 maps with 4 transparent overlays plus 12-page statistical supplement. Paris: Librairie Hachette, 1959.

This is an excellent example of the recently developed use of transparent map-overlays for the synthesis and analysis of the principal geographical factors concerning a country—in this case France. On the base maps showing Geology, Relief, and Population can be superimposed separately, or together, the four economic overlays of Power, Metal Industries, Textile and Chemical Industries, Roads and Tourist Centres. In all thirty different map-combinations can be achieved with remarkable clarity, though inevitably not all the alternatives are useful or informative. An extra dimension is provided by the statistical supplement which shows France's economic development from 1913 to the present. This dynamic aspect is justifiably restricted to tabular or graphical form. Taken together the outcome is a vivid three-dimensional view of France. J.C.B.

Atlas of the Classical World. Edited by A. A. M. van der Heyden and H. H. Scullard. 14 × 10. Pp. 222. 73 maps. 475 photographs. Edinburgh: Thomas Nelson and Sons Ltd, 1959. 70s.

Like earlier volumes on the *Bible* and the *Early Christian World*, this handsome Atlas is intended to be a general introduction to the world of Greece and Rome. It is as much concerned with political and military history, literature, philosophy, art, architecture and other subjects as with maps and strictly geographic material. If this encyclopaedic conception be granted, there can be no doubt that the book fulfils its function admirably. Although a mass of detailed information has been packed into a small space, it is on the whole accurate and fairly presented. The text is readable and the numerous photographs form a vivid supplement to both text and maps.

If any part of the book calls for criticism it is the maps themselves. There is a wide gap between small-scale maps of countries or large regions on the one hand and town-plans or aerial photographs on the other. In some cases too the simple form and attractive colouring of the map are overwhelmed by the historical letter-press overprinted on it; and often there is no indication of scale. While the aerial photographs give a valuable indication of the terrain, and are in fact indispensable, it may be thought that some of the space occupied by representations of vases, sculpture and architectural details could have been devoted more suitably to larger-scale maps of important districts, unencumbered by legends.

In this way the Atlas would certainly have been more useful to the classical scholar; but it might also have given the general reader a fuller, less kaleidoscopic picture of the ancient world. Nevertheless it would be unreasonable to complain of what the editors have left out, if this meant ignoring the merit of what they have put in. The book within the limits they have set themselves deserves high praise. A.J.B.

GENERAL

Propos d'un Géographe. by André Allix. Special Number of the *Revue de Géographie de Lyon*. 9 $\frac{1}{2}$ × 6 $\frac{1}{4}$. Pp. 265. Frontispiece and 12 figs. Lyon, 1960.

André Allix, Recteur de l'Académie de Lyon, retired from office this year, and the present volume has been issued by a group of colleagues and former students

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to mark the occasion. It contains 28 papers or excerpts from his published geographical work, the earliest dated 1923, and no less than 12 bearing dates later than 1945, in which year he took up his duties as Recteur. Pride of place goes to a paper which is a revised version of his 'Man in Human Geography', published in the Society's magazine in 1948. (*S.G.M.* Vol. 64)

Professor Allix's name has become well known in recent years as that of the co-author of the massive *Géographie des Textiles* and the editor of the *Revue de Géographie de Lyon*. The present collection, however, reveals something of the breadth of his scholarship. The papers are divided into four groups, human, economic, physical and historical, while a final paper deals with the spirit and methods of geography. He seems equally at home with the terraces of the Rhône and the civilisations of the Far East; he reports temperatures beneath the Alpine ice, or gently mocks his fellow geographers in whimsical book reviews here reproduced. Like other great French geographers whose work this volume recalls to mind, he can be down-to-earth or philosophical with equal skill and, it may be added, with equal enjoyment for the reader. J.H.P.

Mackenzie's Grave. By O. Chadwick. 9×6. Pp.254. Frontispiece and map. London: Hodder and Stoughton, 1959, 25s.

Mackenzie of this title was Charles Frederick Mackenzie, who after having been consecrated Anglican "bishop of the mission to the tribes in the neighbourhood of Lake Nyasa and the Shire River", arrived in what is now southern Nyasaland in mid-July 1861, and died there on the 31st of January, 1862. He and his dozen or so fellow-missionaries were the first who responded to Livingstone's call for a Christian settlement to carry on the philanthropic work that his explorations had begun.

But this narrative does not end with the burial of Bishop Mackenzie. It is a full record of the history of the mission, down to its withdrawal from Nyasaland by the succeeding bishop, in late 1863. That history is one of continually having to choose which horn of successive dilemmas offered some spark of hope for the future, and it cannot be said that any different choice would have had any better outcome. To submit to the guidance of Livingstone, whose geographical convictions varied, or to use independent judgement. To keep the peace with native authorities, or to liberate slaves. To accept alliance with morally dubious tribesmen, or to refuse to compromise on principles. They all kept recurring, none was ever settled and cleared out of the way; and they wrecked the morale of the missionaries as individuals, and their unity as a society.

In addition, the physical conditions of existence in what had been reported to be "white man's country" proved to be murderous. Three others died, none maintained even fair health anywhere in the country. The promise that the country could produce not only subsistence but marketable surplus found no support in the missionaries' observation and experience. And the last straw was that no faith could be reposed in African man. Livingstone's faithful Makololo were not so faithful to his fellow-countrymen. It was impossible to sort out the tribesfolk into a slaving tribe and an innocent tribe of victims, as had been assumed. Who made whom slaves depended simply on who had most and most effective firearms. This is all salutary reading for those who derive all African sorrows from European exploiters.

One or two passing observations in a generally reliable account are open to criticism. On page 47 the Nyasalanders are said to have been found to lack a word of their own for "freedom". They have certainly a word for the dignified responsible man who is not a slave, and that seems good enough. In the index, and *passim* in the text, the Portuguese Mariano is called Metakenya; but he is in fact remembered as Matekenya. Those who know other contemporary writings may find it difficult to recognise Rikania as a rendering of Lichenya, Ramaou for Ranyau or Ranyow. But these are small points which will only be noticed by readers who know enough to put them right; and the main part of the book will instruct them with the rest. T.P.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

REPORT OF COUNCIL

SEVENTY-SIXTH SESSION, 1959-60

(For the year 1st May, 1959 to 30th April, 1960)

The Council have the honour to submit the following Report:—

MEMBERSHIP

The changes during the Session are as follows:—

On the Roll at 1st May 1959	3348
New members	733
	4081
Deduct by Death	23
„ „ Resignation	669
	692
On the Roll at 30th April, 1960	3389

The fluctuation in the different categories of Membership at the four centres of the Society is analysed as follows:—

	April 1959	April 1960		April 1959	April 1960
Edinburgh			Glasgow		
Life	260	264	Life	33	33
Ordinary	1237	1203	Ordinary	1004	1053
Associate	31	29	Associate	21	28
Junior	56	37			
Corporate			Corporate		
(Schools)	14	10	(Schools)	27	20
Aberdeen			Dundee		
Life	9	8	Life	2	3
Ordinary	347	343	Ordinary	170	199
Associate	—	3	Associate	1	1
Outside Areas			Honorary		
Members	120	139	Members	16	16

MEDAL AWARDS

The Scottish Universities' Medals were awarded to:— Anne M. S. Graham, St Andrews University; Diana B. R. Will, Aberdeen University; John S. Dunlop, Glasgow University; Isa Bowie, Edinburgh University.

NEWBIGIN PRIZE

The Newbigin Prize for 1959 was awarded to R. Goodwin for his essay on "Some Physical and Social Factors in the Evolution of a Mining Landscape".

1959 SUMMER TOURS

During the summer of 1959 129 members took part in the tour to Northern Spain and the Pyrenees; 10 in the tour to Norway, and 33 in the tour to Canada and the United States.

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MEETINGS OF THE SOCIETY

The Society held forty-seven Meetings during the Session. In Edinburgh, six Evening Lectures in the Usher Hall: ten Afternoon Lectures and three Evening Lectures in the Central Hall.

In Glasgow, six Evening Lectures in the St Andrews (Grand) Hall; six Afternoon Lectures and one Evening Lecture in the St Andrews (Berkeley) Hall: one Childrens Hogmanay Film Show: one Lecture Luncheon and the Annual Summer Excursion.

In Aberdeen and Dundee: six Evening Lectures.

Lectures are currently listed in The Scottish Geographical Magazine.

THE SCOTTISH GEOGRAPHICAL MAGAZINE

Three issues each of 64 pages have appeared with the usual number of half-tones and line blocks. The Council gratefully acknowledge a grant towards the cost of production received from the Carnegie Trust. They also record their thanks to the contributors of original papers and reviews of books. The receipt of current publications from authors and publishers is likewise much appreciated.

LIBRARY AND MAP DEPARTMENT

Additions to Library:— 275 books, of which 127 were purchased; 43 pamphlets; 7 film strips; 5,500 maps and charts.

The Council thank those who have supported the Society with the presentation of books, maps and charts.

THE SOCIETY'S 75th ANNIVERSARY

Edinburgh: An Evening Reception was held in the Assembly Rooms after the Opening Lecture by H. R. H. Prince Peter of Greece and Denmark on 22nd October 1959. The Earl of Wemyss and March, President, and Prince Peter, received the guests.

Dundee: A dinner was held in the Queen's Hotel on 26th November 1959. Miss Tyrie, Chairman of the Centre, received the guests who included Dr Douglas Guthrie, representing the Earl of Wemyss, and the Master of Queen's College.

LEGACIES

The Council acknowledge with appreciation, the following gifts:— £100 from the late Miss Ruth M. Raeburn; £81.17.6 from the residuary legatees of the late Miss Jean Belfrage.

THE SOCIETY'S REPRESENTATIVES

The following Members were appointed to represent the Society on the bodies named:—

Bruce Memorial Prize Committee—Sir James M. Wordie, C.B.E.

Joint Committee for Anthropological Research and Training—Robert Kerr, O.B.E.

National Committee for Geography—Professor Andrew C. O'Dell.

National Trust for Scotland—Dr John Bartholomew, C.B.E., M.C., J.P.

Permanent Committee on Geographical Names—John C. Bartholomew.

National Institute of Oceanography—Professor Ronald Miller.

Scottish National Memorial to David Livingstone—Lt-Col. John Johnston, O.B.E.

OBITUARY

The Council regret the loss by death of Dr W. Clarke Souter, Vice President. 1951-59.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY REVENUE AND EXPENDITURE ACCOUNT Year to 30th April 1959

SUBSCRIPTIONS :		REVENUE	
Ordinary
Schools	£4,722
Corporate	136
Junior	164
			£4,974
LIFE MEMBERSHIP FEES :			
Proportion applicable to Revenue	132
GOVERNMENT GRANT	278
Total Ordinary Revenue	£5,381
EXPENDITURE			
MAGAZINE—Expenses of Publication :			
Printing	£966
Editing	118
Illustrations	82
Wrappers, Index, Miscellaneous	118
Postages	291
Less :			£1,562
Current Magazines sold	£319
Advertisements	136
Grant from the Carnegie Trust	100
Sale of Reprints	12
			567
ROOMS—UPKEEP OF :			
Rent, Rates, Insurance	£223
Cleaning and Repairs	99
Heating and Lighting	78
Equipment and Furnishings	261
Less :			£660
Hire of Rooms	6
			654
LECTURES			
Less Tickets sold	£2,068
			277
SALARIES AND HONORARIA			
AUDITOR FEES	1,789
LIBRARY	1,461
Purchase of Books and Maps	21
Furnishings	£268
			57
GENERAL PRINTING			
STATIONERY AND ACCOUNT BOOKS	326
MEDALS	318
POSTAGES AND TELEPHONE	89
MISCELLANEOUS	18
			120
			210
			£8,000
EXCESS OF EXPENDITURE OVER REVENUE		619
			£6,000
DIVIDENDS AND INTEREST		£1,806
			£1,806
EXCESS OF EXPENDITURE OVER REVENUE BROUGHT DOWN		£819
PROVISION FOR FURNISHINGS, etc.		773
SURPLUS FOR THE YEAR		100
			16
			£1,806

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ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

PROCEEDINGS

MEETINGS OF COUNCIL were held on 3rd June, 29th July and 18th November, 1960

ANNUAL GENERAL MEETING

The Annual General Meeting was held in the Society's Rooms in Edinburgh on 20th October, 1960, Dr Douglas A. Allan, C.B.E., Vice President in the Chair.

The Annual Report of Council and the Accounts for the year to 30th April, 1960, were unanimously adopted.

The following were elected :

Vice President : Erik Schacke.

Vice Presidents serving on Council : J. Cameron Smail, Douglas Guthrie, Arthur W. Russell, Alexander Harrison, John Johnston, Miss I. W. Hutchison, Douglas A. Allan, J. G. Harley.

Members of Council : Alexander Douglas, Robert Inglis, Robert Kerr, Ian Kinniburgh, Mrs A. F. C. Lamont, Mrs K. L. MacGillivray, Sidney M. T. Newman, J. E. Richey, C. J. Robertson, A. Graham Service, George A. Watt.

LECTURE SESSIONS 1960-61

The following lectures were delivered :

EDINBURGH : *Usher Hall* - Sir Allen Brown, C.B.E., M.A., LL.M., on "Recent Developments in Australia", on 20th October. John Tunstall on "Madagascar" on 17th November. Colin Jackson on "The Far East in 1960" on 15th December. *Central Hall* - W. P. Haldane, M.B.E., B.Sc., on "A Trip to the Americas" on 26th October. M. Kay-Larsen on "Denmark Today" on 9th November. Mrs Elsie G. Cairns on "Linger and Look" on 30th November. Barclay S. Fraser on "Pilgrims and Peaks in Northern Spain" on 7th December. D. G. Moir on "R.S.G.S. Tour to Prague and Budapest and Scenes from Scandinavia" on 16th December. Sydney H. Jones on "A Roman Holiday" on 21st December. *The Society's Rooms* - John Keates, M.A., on "Cartography in Sweden" on 3rd November. Professor E. Estyn Evans, M.A., D.Sc., on "Geography and Folklife : Some illustrations from Ireland" on 10th November. R. B. K. Stevenson, M.A., F.S.A., on "The earliest agricultural communities in Scotland" on 8th December.

GLASGOW : *St Andrew's (Grand) Hall* - Tom Weir on "Life Among the Berbers" on 12th October. John Tunstall on "Madagascar" on 16th November. Colin Jackson on "The Far East in 1960" on 14th December. *St. Andrew's (Berkeley) Hall* - W. P. Haldane, M.B.E., B.Sc., on "A Trip to the Americas" on 27th October. D. G. Moir on "The 1960 R.S.G.S. Tour to Prague and Budapest" on 25th November. Mrs Elsie G. Cairns on "Linger and Look" on 1st December. Sydney H. Jones on "A Roman Holiday" on 22nd December. *The University Geography Lecture Theatre* - Professor E. Estyn Evans on "Geography and Folklife : Some illustrations from Ireland" on 9th November. R. B. K. Stevenson, M.A., F.S.A., on "The Earliest Agricultural Communities in Scotland" on 7th December.

ABERDEEN : *Y.M.C.A. Hall* - Rt. Hon. The Earl of Mansfield, B.A., F.Z.S., F.R.H.S., on "The West Indies" on 17th October. Tom Weir on "Life Among the Berbers" on 14th November. A. C. Hopekirk on "The South Pacific Islands" on 12th December.

DUNDEE : *St Paul's Hall* - The Rt. Hon. The Earl of Mansfield, B.A., F.Z.S., F.R.H.S., on "The West Indies" on 18th October. Tom Weir on "Life Among the Berbers" on 15th November. A. C. Hopekirk on "The South Pacific Islands" on 13th December.

SCOTTISH INTER-UNIVERSITIES GEOGRAPHICAL SOCIETIES CONFERENCE, 1960

An annual Conference to establish contact between the Student Geographical Societies of the four Scottish Universities has been promoted and initiated by the Aberdeen Geographical Society. The first meeting, held in Aberdeen from 11th-12th November, 1960, was well attended by 70 representatives from three of the Universities—St Andrews, Glasgow and Aberdeen.

Of the papers read, two were concerned with the home problems of "Crofting in Scotland" (J. R. Coull, *Aberdeen*) and "Transport and Geography in the Western Highlands" (I. Skewis, *Glasgow*). These interesting papers gave both a generalised and particular view of the existing situation with suggestions for future research and policies. The discussion which followed served to emphasise not only the complexity of the problems but the different approaches taken and conclusions reached by individual workers in the same field. Other discussions included "An Introduction to Tarradale" (A. Small, *Aberdeen*) - Aberdeen's new field centre on the Black Isle; "A Regional Study of the Area of Taita, Kenya" (D. C. Millamba, *St Andrews*) and "Dredge, Drain and Reclaim" (A. S. Fraser, *Aberdeen*), on aspects of land utilisation in the Netherlands. There was, in addition, a field excursion led by Dr K. Walton of the department's staff, to study coastal morphology. In the vicinity of the Ythan estuary the processes and landforms associated with the interaction of four antagonistic ice sheets and several post-glacial changes in sea level were observed. There were also discussions of the human geography of the area and the historical development of the townships of Collieston, Newburgh and Ellon.

Social activities included a reception and lunch in the Crombie Hall and a dinner dance in the Elphinstone Hall which effectively broke any remaining ice. Aberdeen Geographical Society must be congratulated for their initiative and superb organisation of this first and most successful conference. The guest members are indebted to them, their department, and their staff for such a satisfying and rewarding integration of academic and social activities. Next year Glasgow University Geographical Society will be hosts to the Conference. JOGSOK

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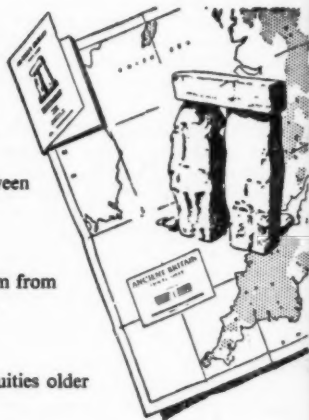
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